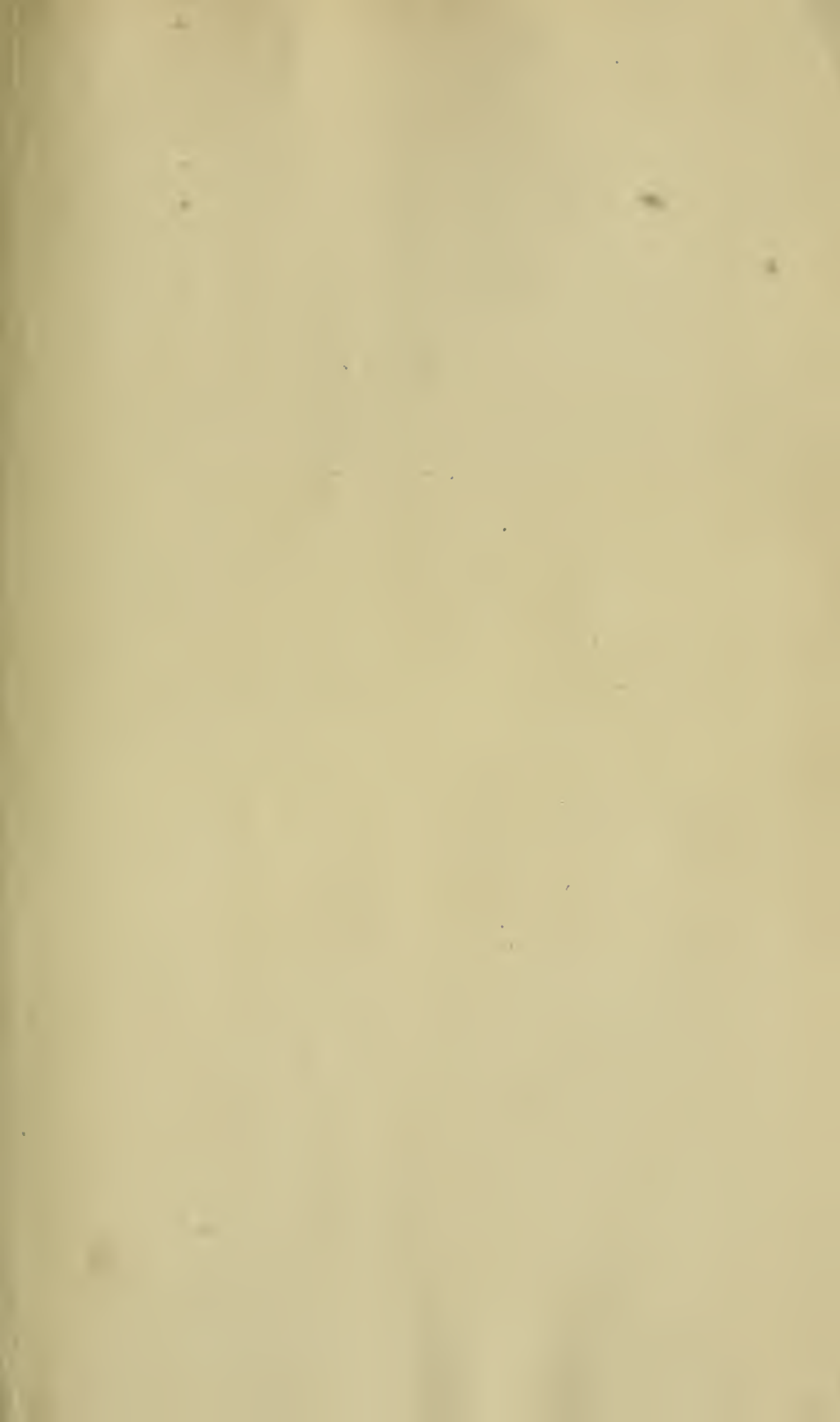
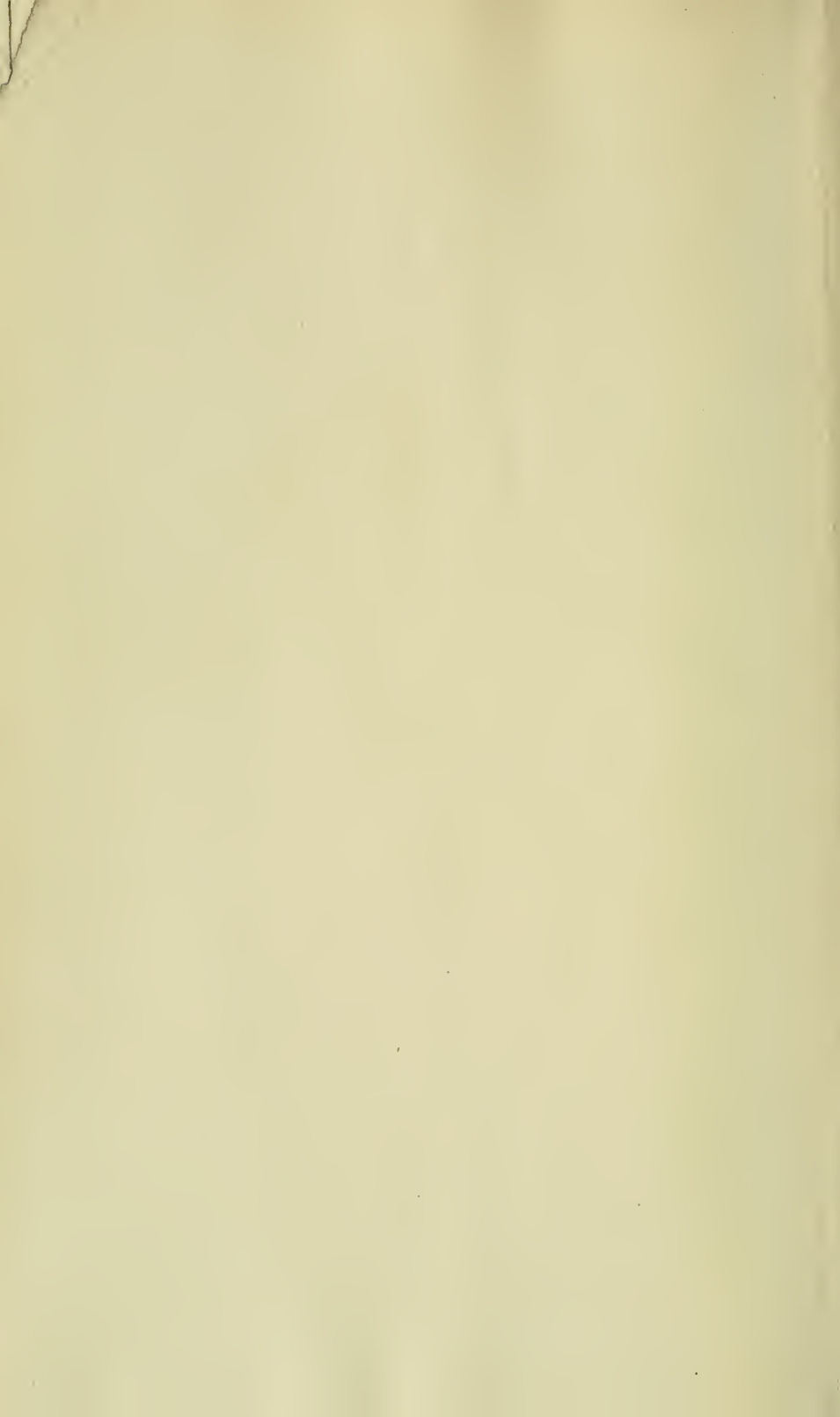




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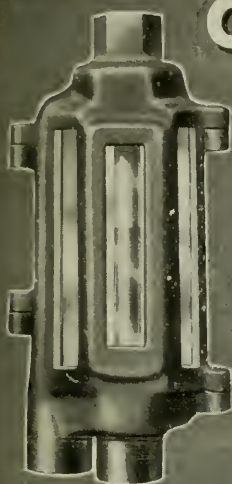
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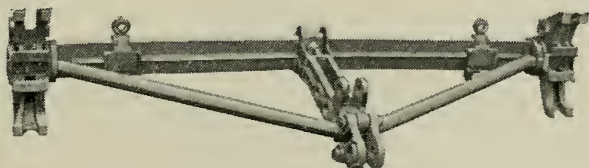
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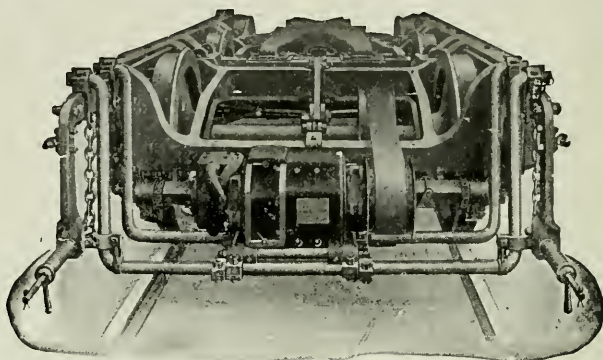
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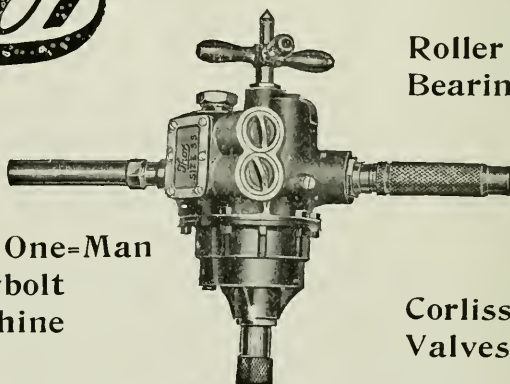
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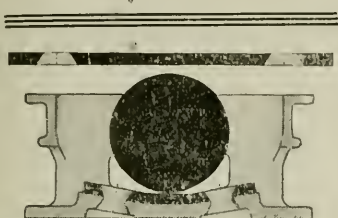
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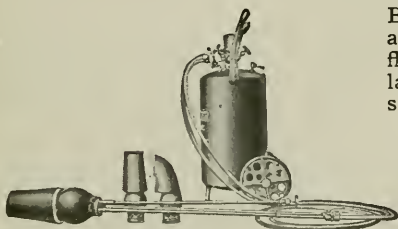
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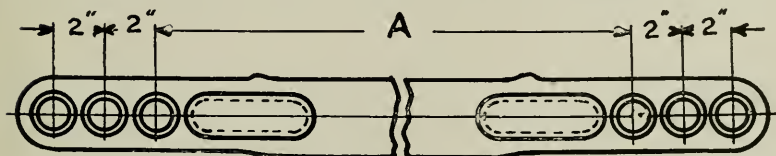
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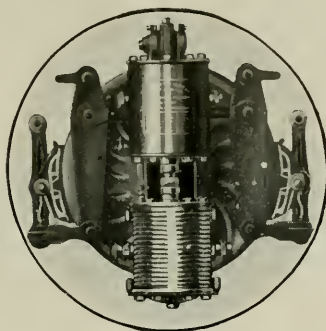
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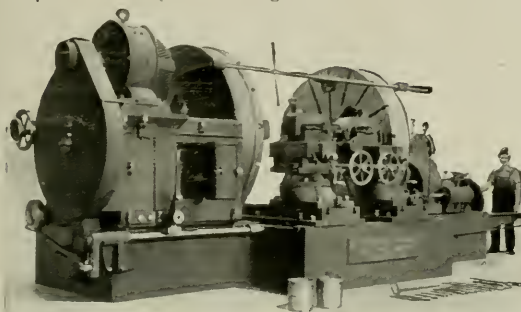
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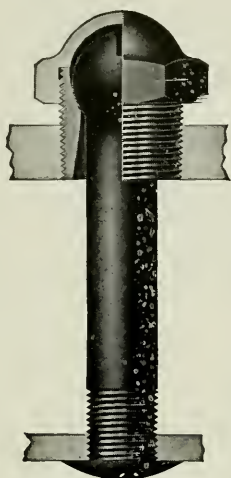
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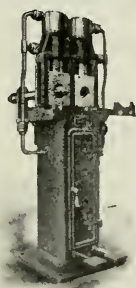
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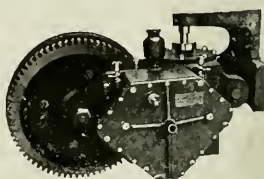


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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs, during the month of November, 1919, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Fourteenth Annual Electrical Night" by several speakers.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"Not received."

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—"Not received."

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Not received."

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Locomotive Operations" by T. J. Hartnett, R. F. of E.,
D. L. & W. R. R.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal Canada.

SUBJECT—"Terminal Power Plants" by W. J. Harding, C. E.,
Ottawa Power Plant.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—Not received.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—Not received.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"Mechanical Firing of Locomotives" by D. F. Crawford,
Vice President and General Manager, Locomotive
Stoker Company, Pittsburgh, Pa.

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No. 1

Pittsburgh, Pa., Nov. 25, 1919

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*H. W. WATTS.....	November, 1907, to April, 1908.
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D. M. HOWE.....	November, 1917, to November, 1918.
J. A. SPIELMANN.....	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING

NOVEMBER 25, 1919.

The meeting was called to order at eight o'clock P. M., at the Americus Club House, Pittsburgh, Pa., with President H. H. Maxfield in the chair.

The following gentlemen registered:

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Burke, John F.	Laylin, M. H.
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Chalker, A. R.	Lloyd, D. W.
Chilcoat, H. E.	Lobez, Pierce L.
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De Vilbiss, E. B.	Orchard, Chas.
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Eckroate, W. H.	Osbourne, Alfred S.
Fink, P. J.	Painter, Joseph

Parke, F. H.	Snyder, R.
Patterson, J. E.	Sponsler, W. L.
Pierce, E. C.	Straub, W. C.
Ralston, J. A.	Strome, H. H.
Redding, D. J.	Stucki, A.
Rhoads, G. A.	Turner, L. H.
Ritts, W. H.	Tutwiler, L. H.
Ruhling, J. V.	Waggoner, Russell E.
Runser, K. W.	Warthen, G. M.
Ryder, Gilbert E.	White, C. C.
Searles, E. J.	Williamson, J. A.
Smith, John L.	Wolf, H. M.
Snyder, Jos.	Wyke, J. W.

VISITORS

Bailey, W. G.	King, G. A., Jr.
Bennett, T. W.	Ludgate, B. A.
Berry, Freeman	Lynch, C. A.
Bradley, Stephen L.	Nicholas, A. D.
Cain, Wm. O.	Patterson, I. J.
Choffin, H. B.	Pifer, Frank C.
Chraska, Leo J.	Prentice, Wade H.
Davis, K. N.	Prouty, E.
Davis, W. R.	Redding, R. D.
Davison, C. R.	Ritts, Orme L.
Denser, J. M.	Ruben, J. W.
Edwards, H. F.	Ryan, Edw.
Gilson, George I.	Stevens, L. V.
Griffin, Thos. G.	Titus, T.
Gwinn, L. J.	Turner, Archer
Hambrock, O. F.	Wagner, E. F.
Harris, C. M.	Walton, F. E.
Hickins, C. C.	Wilkinson, B. L.
Huff, A. B.	Wilson, Chester
Kelso, William	Wyeth, Ross
Wyrough, C. J.	

The minutes of the previous meeting being printed, the reading of the same was dispensed with.

The Secretary read the following proposals for membership:

DeBruin, N. M., Chief Engineer, Herndon Co., 912 Keystone Bldg., Pittsburgh, Pa. Recommended by J. F. Townsend.

Falkenstein, Wm. H., Superintendent, Railway Steel Spring

- Co., 25th and Smallman Street, Pittsburgh, Pa. Recommended by H. F. Gilg.
- Gwinn, Leven J., Air Brake Instructor, W. A. B. Co., 5759 Howe Street, East Liberty, Pittsburgh, Pa. Recommended by P. L. Lobez.
- Harris, C. M., Engineer, W. E. & Mfg. Co., East Pittsburgh, Pa. Recommended by R. G. Bennett.
- Herndon, Jno. C., President, Herndon Co., 912 Keystone Bldg., Pittsburgh, Pa. Recommended by J. F. Townsend.
- Lynch, C. A., Sales Representative, Fort Pitt Steel Casting Co., McKeesport, Pa. Recommended by John W. Guay.
- Macleam, Malcolm R., Sales Manager, Duquesne Steel Foundry Co., Pittsburgh, Pa. Recommended by H. H. Maxfield.
- Maloney, J. J., Chief Electrician, Monon. Conn. R. R., 3213 Park View Avenue, Pittsburgh, Pa. Recommended by S. W. Miller.
- Minick, Don C., Act. M. M., P. R. R. Western Lines, Cambridge, Ohio. Recommended by W. C. Straub.
- Moerman, W. G., Secretary, Herndon Co., 912 Keystone Bldg., Pittsburgh, Pa. Recommended by J. F. Townsend.
- McKim, Charles E., V. P., Herndon Co., 912 Keystone Bldg., Pittsburgh, Pa. Recommended by J. F. Townsend.
- McMunn, Daniel G., Assistant E. H. Foreman, P. R. R. Co., 28th Street and Liberty Avenue, Pittsburgh, Pa. Recommended by R. G. Bennett.
- Neff, L. M., E. H. Foreman, P. R. R., 28th Street Engine House, 28th Street and Liberty Avenue, Pittsburgh, Pa. Recommended by R. G. Bennett.
- Pifer, Frank C., Inspector, J. & L. Steel Co., 2130 Philadelphia Avenue, Dormont, Pa. Recommended by D. W. McDowell.
- Read, Sylvester C., Inspector M. P., Penna. R. R. Co., 6844 Thomas Blvd., Pittsburgh, Pa. Recommended by R. G. Bennett.
- Shea, J. E., Assistant Res. Car Inspector, Penna. Lines West,

Care Greenville Steel Car Co., Greenville, Pa. Recommended by A. J. Rose.

Van Vranken, S. E., P. A., Locomotive Stoker Co., 214½ Park Avenue, Ben Avon, Pa. Recommended by Henry F. Gilg.

Wyrough, C. J., M. P. Inspector, P. R. R., 6338 Aurelia Street, Pittsburgh, Pa. Recommended by R. G. Bennett.

Yardley, Harry, Res. Car Inspector, Penna. Lines West, Care Greenville Steel Car Co., Greenville, Pa. Recommended by A. J. Rose.

Zitzman, Frank A., Electrician, Monon. Conn. R. R., 3204 Ward Street, Pittsburgh, Pa. Recommended by S. W. Miller.

PRESIDENT: After these applications have been approved by the Executive Committee the gentlemen will become members of the Club without further action.

Under the head of new business I wish to state that at a meeting of the Executive Committee the chair was authorized to appoint a committee on Reception and a committee on Subjects. These committees are as follows:

Committee on Subjects:

John F. Lent, Chairman; Chas. Orchard, Jno. B. Wright, D. F. Crawford, E. B. DeVilbiss.

Reception Committee:

E. Emery, Chairman; F. H. Freshwater, J. L. Smith, H. F. Grewe, H. M. Wolf, S. E. Van Vranken.

MR. STUCKI: I would like to say a few words in regard to our dues and initiation fee, and providing it meets with your approval, I would make a motion to this effect, that for any new member the initiation fee and the fee for the first year, regardless of when he may come in, shall be \$3.00 except those proposed either in September or October. Names proposed in September or October, to have their dues credited for the year following.

MR. D. M. HOWE: According to our constitution that would have to be submitted as a resolution and lay over for one month.

PRESIDENT: That is what the chair understood was the intention of Mr. Stucki. It would have to be submitted in writing.

MR. D. M. HOWE: I would like to speak of a matter and that is this, yesterday was a great day for Pittsburgh, the seventy-ninth anniversary of a dear, old honorable member of our Club, Uncle John Brashear. And I wish to call this to the attention of our worthy Secretary and members and ask that we have a complimentary letter sent to Uncle John if it has not already been done. We always speak of Uncle John as the man who brought sunshine into the world. We never accused him of bringing moonshine into the world.

SECRETARY: I might say I did not write him in behalf of the Club, but being acquainted with Uncle John, I took it upon myself to write him a letter, congratulating him upon his long life, usefulness and so on. However, I will be glad to incorporate and send him another letter, telling him this action has been taken, if that is your pleasure.

PRESIDENT: If there are no objections, the Secretary will be instructed to write a letter of congratulations and best wishes to Dr. Brashear in the name of the Club.

Gentlemen, we are favored this evening by having a paper on "Mechanical Firing of Locomotives" by a gentleman whom I think it is conceded knows as much about mechanical firing of locomotives, if not more, than any other mechanical expert in the United States. As the Secretary very aptly said in his announcement of this meeting, the speaker of the evening needs no introduction to this Club. I therefore take pleasure in presenting Mr. D. F. Crawford.

MECHANICAL FIRING OF LOCOMOTIVES.

By Mr. D. F. Crawford,

Vice-President and General Manager Locomotive Stoker Company
Pittsburgh, Pa.

There are two very good reasons why I should not present to you a paper on this subject:

First. There are at the present time nearly five thousand (5,000) locomotives in the United States fired by mechanical devices; therefore, their existence should be material evidence as to their necessity.

Second. The literature already existing, especially the several excellent contributions (from which many extracts are included herein) by my colleague Mr. W. S. Bartholomew, have so fully presented the subject.

There are three reasons why a paper on this most important subject should be of interest to our Club:

First. As there are approximately five thousand mechanically fired locomotives in the United States—What led to the introduction and continued application of locomotive stokers?

Second. What has the experience gained during their development and use indicated?

Third. What are the questions brought about by their introduction which must be considered by the Railway Officers?

As most of you already know, I was one of the pioneers in this work, having been actively engaged in the design, development, operation and manufacture of stokers for locomotives since 1903, and I assure you while it was a pleasant task, it was by no stretch of imagination the least difficult of the many problems that came my way.

With the large number of mechanical stokers already in use, undoubtedly you are all so familiar with the details of their construction and operation that I may omit description and comments on the several types and confine my remarks to the three reasons already referred to for presenting this paper to you.

Although my ideas on the subject had crystalized long before 1913, I am sure that my statement to the Convention of the Master Mechanics Association in the year mentioned will be of interest in connection with the question—"What led to the introduction and continued application of Locomotive Stokers?"

"The development of the Locomotive Stoker on the Pennsylvania Lines was brought about by a desire to get more tons per train over the road. I had observed in the Annual Reports of many of the Railroads, the tons of train hauled per pound of tractive power was decreasing as the engines grew large. I found that the locomotives that were twenty per cent (20%) larger than other locomotives were hauling the same trains as the smaller ones and were not realizing the full twenty per cent (20%) additional tractive power that the locomotives had. The Stoker problem to me was one of decreased operating expenses by increasing the train load for each unit on which we had to pay interest and maintenance charges."

Mr. C. D. Young, after consideration of certain locomotive tests, stated—"If we use six thousand (6,000) pounds of coal, and this locomotive is capable of burning ten thousand (10,000) pounds per hour, or, say if a fireman will fire six thousand (6,000) pounds per hour, and the locomotive is capable of burning ten thousand (10,000) pounds with a stoker, it is then possible for you to obtain the maximum of that locomotive with the stoker, whereas you do not come to sixty per cent (60%) of the maximum output with the fireman."

These statements made in 1913 are of equal value and importance in 1919—and after all are the fundamental reasons for the existence (present and future use) of the Locomotive Stoker.

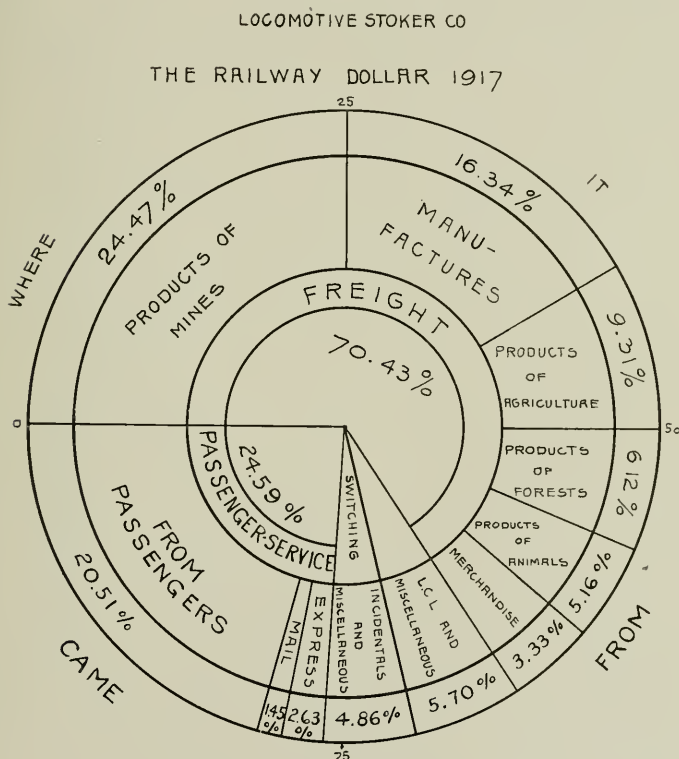
While what we regard as large locomotives were in limited use before the advent of the Stoker, its development and application has and will permit more fully utilization of the capital invested both in the locomotive and permanent way.

Let us for a few moments analyze just what locomotives of large capacity have meant to the railroads and to the

people of the United States in giving them transportation at the lowest unit cost achieved in the world.

To do this we will ascertain, first—"Where the Railroad Dollar Came From," and we must call on Mr. Slason Thompson to help us do this.

The illustration shows this information for the year 1917, a period of heavy traffic and some congestion, but which on the whole may be regarded as not seriously disturbed by war conditions.

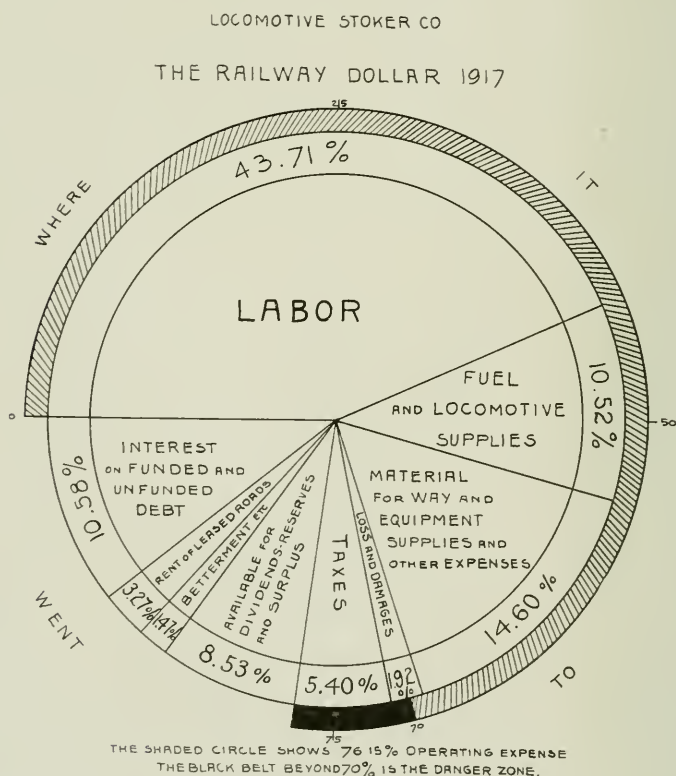


THE SOURCE OF THE RAILWAY DOLLAR.

It will be noted that 70.43% came from the earnings of freight traffic and that 24.47% of the earnings from products of mines, which from their nature may be hauled in heavy trains. Passengers contributed 20.51%, and this, with mail and express added, made a total for passenger train service of 24.59%.

While large locomotives in passenger service have expedited the service and permitted hauling heavier trains, in view of the greater earnings obtained from freight service, the latter from the viewpoint of this offering may be regarded as of the most importance.

The next step is to ascertain where it (The Railway Dollar) went to. The illustration shows this clearly, and it will be noted that several of the items are quite independent of the weight of the train. That is, the expense does not increase in proportion to the weight of the train, and therefore the larger the train the lower the cost per ton mile, and low cost per ton mile is what the public is most interested in.

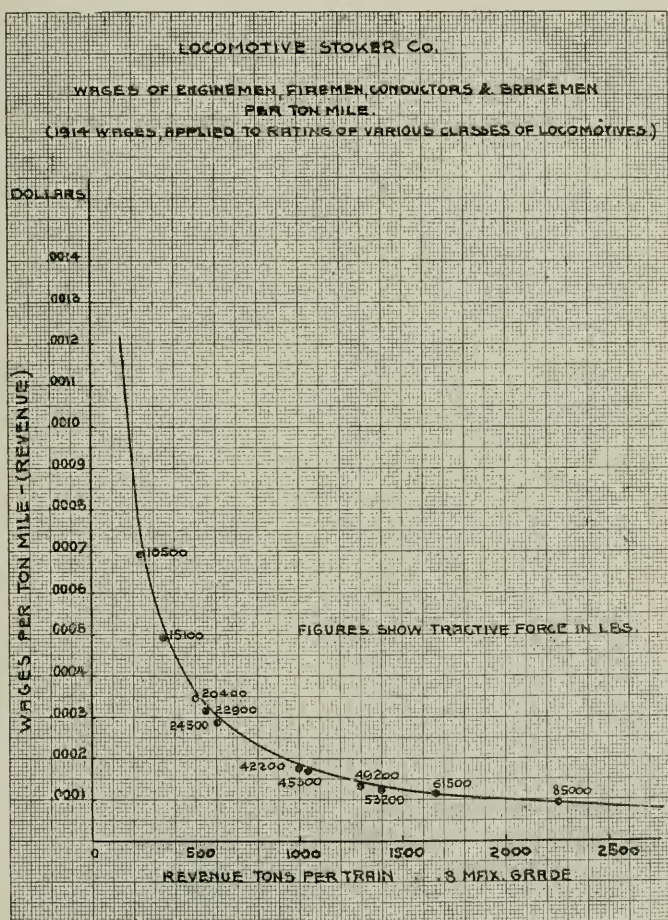


THE DISTRIBUTION OF THE RAILWAY DOLLAR.

Among the items which may be considered as decreasing in cost per ton mile in some proportion to the increase in

tons per train are fuel costs, (and I call particular attention to the illustration that fuel is 9.85% of the total expenses (crew's wages), equipment, track structure and signal maintenance as well as certain other fixed and operating charges.

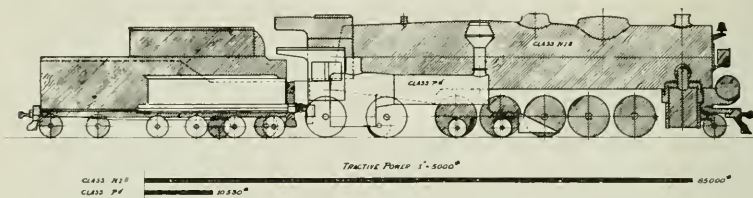
The effect of the introduction of large locomotives on a given division operated to their capacity (which the mechanical stoker makes possible) is shown by the curve, in which the crew's wages per ton mile is shown in comparison with



RELATION OF TRACTIVE FORCE AND TONS PER TRAIN
TO CREW'S WAGES.

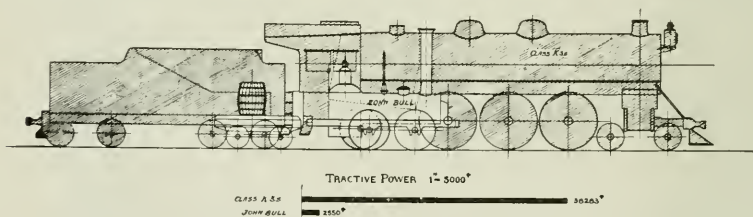
the revenue tons per train and indicates the results that may be expected by the use of locomotives of various capacities.

As a matter of interest a diagram showing the relative size of the locomotives of 10,600 pounds tractive power and 85,000 pounds tractive power is shown.

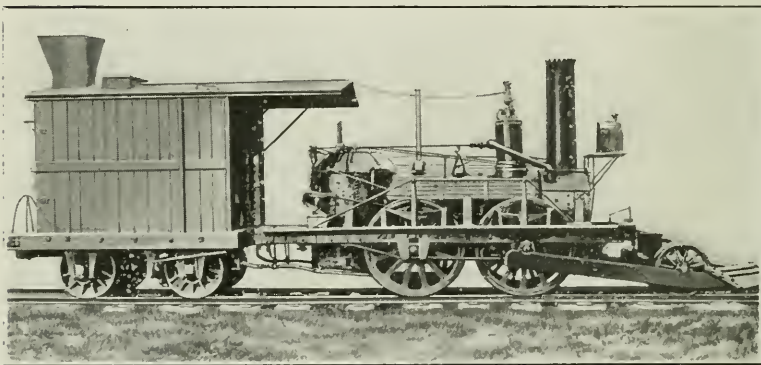


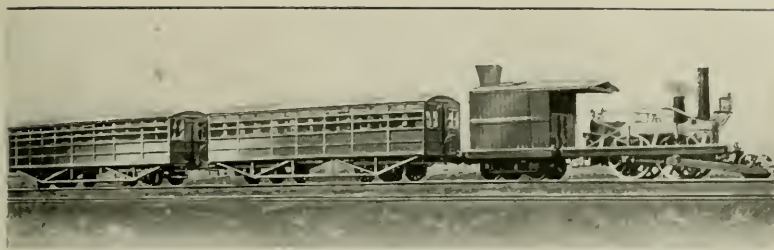
COMPARATIVE DIMENSIONS OF LOCOMOTIVES OF 10,600 POUNDS
AND 85,000 POUNDS TRACTIVE FORCE.

To avoid the criticism of entirely disregarding the Passenger Service—an illustration indicating the progress in the capacity of locomotives for passenger service is given, comparing the “John Bull” of 1831 with a modern Pacific type locomotive. A number of the latter type have been equipped



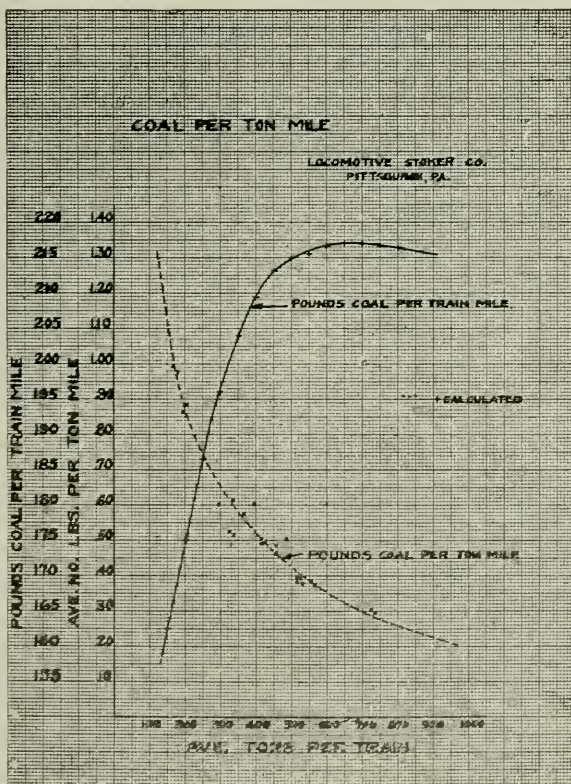
COMPARATIVE DIMENSIONS OF A MODERN PACIFIC TYPE
LOCOMOTIVE AND THE LOCOMOTIVE 1831.





with mechanical stokers, resulting in making better time with heavy trains and fewer delays charged to "NOT STEAMING" and now show as a matter of interest the "John Bull" as it appeared in 1903 when it made its last trip, and the train it hauled at that time.

That there is a definite relation between the coal used

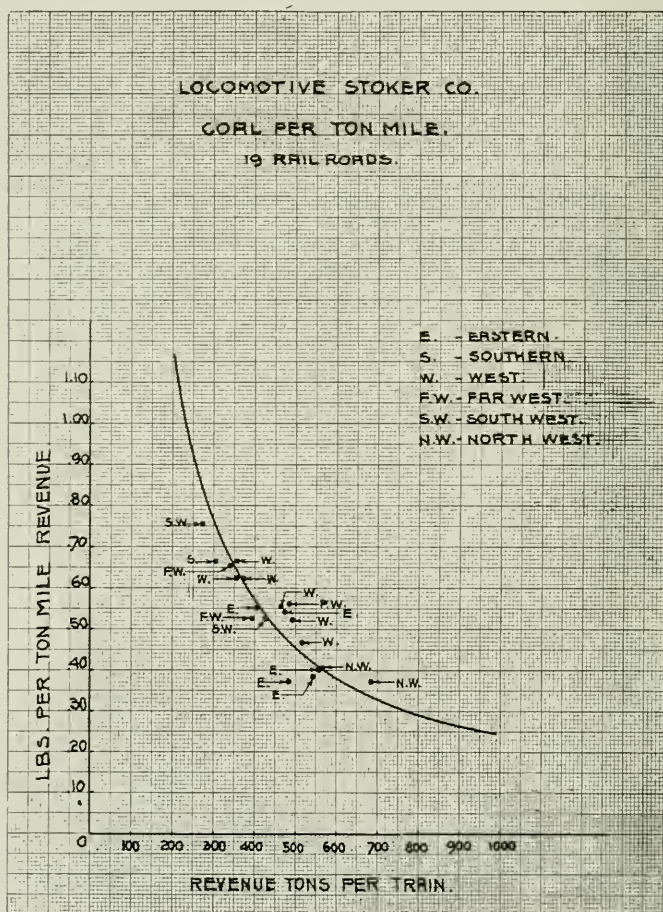


RELATION BETWEEN COAL PER TON MILE AND TONS PER TRAIN.

per ton mile and the revenue tons per train I think is clearly shown by the diagram, which shows the coal used per ton mile for the various weights of train on twenty-two divisions of one of the eastern railroads.

As further evidence of the accuracy of this conclusion a diagram giving similar data for nineteen railroads in various parts of the United States is shown, this information being obtained from the annual reports of the railroads included.

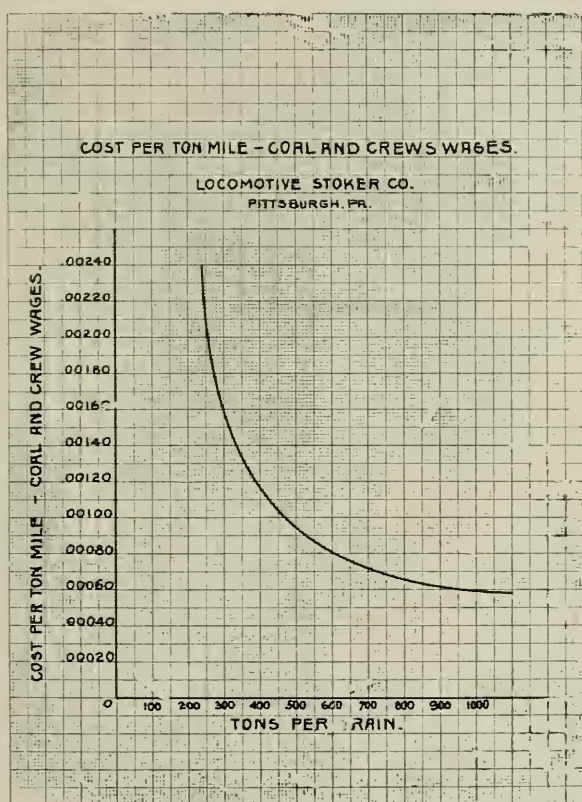
Notwithstanding the wide variation in traffic operating,



RELATION BETWEEN COAL PER TON MILE AND TONS PER TRAIN.
NINETEEN RAILROADS.

grade and equipment conditions and in the quality of the fuels used, the fact that increased train loading brings a decrease in fuel per ton mile is substantiated.

An illustration of how the cost of crew's wages per ton mile is affected by the size of the locomotive, and consequently the tons per train, has already been presented, and therefore a combination of the fuel and crew costs will undoubtedly be of interest and the diagram now before you shows the data obtained from practice.



COST OF COAL AND CREW'S WAGES AS RELATED
TO TONS PER TRAIN.

It is of course difficult to state in a few words just what the use of locomotives of large capacity has meant to those making use of the transportation facilities of the coun-

try, but, by their use the average revenue tons per train in the United States was increased from 176 tons in 1888 to 351 tons in 1907 and 620 tons in 1917.

This increase in the amount of traffic moved by a train unit permitted the results disclosed below:

Year	Revenue Tons Per Train	Receipts Per Ton Mile	Receipts Per Train Mile	Cost of Fuel Per Train Mile	Actual Price	Ton Mile Equated Price	Price of Coal Per Ton	
1888.....	176	\$0.01001	\$1.76	\$				*
1907.....	357	0.00759	2.71	0.21	\$0.0006	\$0.0006	\$1.14	
1917.....	620	0.00728	4.51	0.43	0.0007	0.0004	2.20	**

* Information not available.

** Estimated from the price of coal in various districts as set by the Fuel Administration and is a conservative figure for the average cost to the Railways.

Notwithstanding the fact that in 1917 the price of coal is shown as nearly double that in 1907, the cost of coal per ton mile was practically the same, and when the price is equated to that of 1907, the decreased cost per ton mile given shows conclusively that a smaller amount was used.

The above figures cover practically all the Railways in the United States, as only those having gross earnings of less than \$100,000.00 per year and strictly switching lines are excluded.

Another important reason for the use of locomotives of the capacity made available by mechanical firing is the reduction of the number of units or trains required to handle a given traffic.

About five years ago query was made as to what would have been the effect if the traffic of given railway system in the year 1912 had been moved in the equipment of capacity that had been used in 1903. Of course in making the calculations for the reply some factors had to be assumed, the conclusions at least indicate the propriety of the increase in capacity of both locomotives and cars.

While a larger number of the smaller locomotives and cars would be required, the fact that the number of units or trains needed so increased the traffic density that to make

the movement with the same degree of promptness as existed in the latter year that the cost of providing additional track facilities far outweighed the cost of the additional equipment.

It must be remembered that a large number of tons per train does not necessarily mean what is commonly termed "drags," but simply the maximum weight for the speed at which it is desirable to operate, as determined by local conditions.

The capacity of the locomotive may be utilized either in obtaining increased speed or increased tractive force.

Without doubt your experience has confirmed the favorable impression of the use of locomotives of large capacity which I have outlined, otherwise their number would be much smaller, but as it is only by the use of a mechanical stoker that the possibilities of such locomotives may be realized, the information given you becomes the reason not only for their development but for their more general application.

In 1903 with locomotives of about 40,000 pounds tractive force and 50 square feet of grate area, from time to time complaints were received from the firemen regarding their arduous work, and frequently men left the railroad service preferring to seek more congenial occupation. This, of course, embarrassed the service, as at times it was difficult to obtain sufficient men to supply the demands, and I well remember the concern of those responsible on account of the large turn over and its effect on the operations. As the size of the locomotives continued to increase the difficulties and complaints grew apace, and it may be said that the climax occurred in 1912 when the firemen in the Eastern Wage Application demanded two firemen on locomotives weighing over 200,000 pounds on the driving wheels.

During the period mentioned several types of mechanical stokers had been built and put in service, but were regarded by both the Railway officers and employees as rather more than less in the experimental stage. Nevertheless such was the confidence of some Railway officers in the stoker that what may be regarded as the first commercial application of the device was made in 1910. Since that time the number

applied per year has gradually increased to the total of five thousand already mentioned and are in use on the locomotives of at least seventy-one of the railroads of the United States.

The following tabulation shows the distribution of those built by the Locomotive Stoker Company and is displayed

LOCOMOTIVE STOKER COMPANY
PITTSBURGH, PA.
STOKERS IN SERVICE
OCTOBER 31, 1919

RAILROADS	TYPE OF LOCOMOTIVE																		
	MALLET		MIKADO		SANTA FE		PACIFIC		CONSOL.		MOUNTAIN		CARTER-12-PEDE WHEEL		DECA-10-00		Total Street	Total Dup.	Grand Total
	Street	Dup.	Street	Dup.	Street	Dup.	Street	Dup.	Street	Dup.	Street	Dup.	Street	Dup.	Street	Dup.			
Ann Arbor					3	4											3	4	4
Atlanta, Birmingham & Atlantic																			
Atchafalaya, Topeka & Santa Fe					98	31	30					6						134	134
Baltimore & Ohio	90	26	308	108	31	5											428	134	563
Balt. Railway of Chicago																		5	5
Bessemer & Lake Erie					20				1								20	1	21
Bingham & Garfield		1																1	1
Boston & Albany																			
Buffalo, Rochester & Pittsburgh	10	38		48													10	88	98
Clev., Cin., Chicago & St. Louis				25														25	25
Carolina, Clinch & Ohio					8													8	8
Chesapeake & Ohio	87	53	56				6				3						152	53	205
Chicago, Milwaukee & St. Paul				50														60	60
Chicago, Indianapolis & Louisville				6														6	6
Chicago & Eastern Illinois				15		7												22	22
Chicago Great Western					10	6												18	18
Chicago & Alton				10														10	10
Central of Georgia		10																10	10
Chicago, Rock Island & Pacific				20		10												30	30
Chicago, Burlington & Quincy			77	63	47	11											124	94	218
Colorado & Southern					5	5											5	5	10
Denver & Rio Grande						10											10	10	10
Duluth, Missabe & Northern	12				54	10			20								18	18	28
Erie													3				57	20	77
El Paso & Southwestern			17						21								38		38
Grand Trunk—Eastern Lines				15														15	15
Grand Trunk—Western Lines				25														25	25
Grand Rapids & Indiana				5														5	5
Great Northern	17	88	42	107													69	188	245
Iowa State Railway		2									10							2	2
Hecking Valley	5	20	11														16	20	36
Indiana Harbor Belt				24														24	24
Korean Government				2														2	2
Lake Erie & Western				15														15	15
Louisville & Nashville				18														18	18
Lehigh Valley			71		40	30											141		141
Lehigh & Hudson				4														4	4
Maine Central				6														6	6
Missouri, Kansas & Texas				10														10	10
Missouri Pacific				15									7					22	22
Michigan Central				20														20	20
Monongahela				10														10	10
New York Central	5			95													5	95	100
New York, New Haven & Hartford						50												50	50
New York, Chicago & St. Louis				10														10	10
New York, Ontario & Western							12											12	12
Norfolk & Western																			
Northern Pacific	133	96															147	96	243
Nashville, Chattanooga & St. Louis				20										14				20	20
Oregon-Washington R. R.				16														15	15
Oregon Short Line				58														48	48
Oregon Short Line																			
Pennsylvania R. R.—Eastern Lines	1	1	1			6												28	28
Pennsylvania R. R.—Western Lines		10				150											2	124	126
Pittsburgh & West Virginia				33														183	183
Philadelphia & Reading	6	15	30	20													35	65	101
Rutland					6													6	6
Seaboard Air Line			16		10		25											51	51
St. Louis Iron Mountain						14												14	14
St. Louis-San Francisco						41	19											41	19
Southern			12		25	75	50										87	75	162
Toledo & Ohio Central					15														
Utah		3				16												8	15
Union Pacific R. R.		18	7	38	25	29	9											58	20
Virginian													1				8	47	55
Wabash					20		25												
Western Maryland			11															45	43
Western Pacific				5														11	11
Wheeling & Lake Erie	20																	5	5
Woodward Iron Co.						1											20	1	21
	424	423	638	1138	367	441	38	20	21	31	3	28	4	14	123	1467	2205	3702	

DISTRIBUTION OF STOKERS BUILT BY THE
LOCOMOTIVE STOKER COMPANY

to indicate to you the confidence that has been established during the past eight years in devices of this kind.

There has been much discussion as to the minimum size of locomotives to which stokers should be applied and as an answer to this question in so far as it applies to Railways in the United States, I cannot do better than to quote some of Mr. Bartholomew's statements made recently before the Western Railway Club:

"Locomotives that can be hand fired to maximum capacity through sustained periods do not require stokers."

"This must mean that we do not need stokers to do a hand firing job and that the stoker job cannot be done by hand."

"This means also that stoker firing and hand firing are not directly comparable."

Based on our experience, this would mean that for freight service, except in special conditions, that stokers should be applied to all locomotives of the following general specifications:

Weight on Drivers	Approximately 200,000 lbs.
Calculated Tractive Power	" 50,000 lbs.
Grate Area	" 60 sq. ft.
Coal required for sustained periods	" 4,000 lbs. per hour

The special conditions referred to are those where the climate is warm and humid, where the runs are of unusual length, grades unusually severe or where even smaller locomotives require more than 4,000 pounds of coal per hour for sustained periods.

An interesting example of such a situation is disclosed of application of stokers to locomotives of the Java State Railways having a tractive power of 43,200 pounds, where not only the climate is severe, but the natives are of small physique.

For locomotives in passenger train service, I am sure favorable results may be expected when the amount of coal used approximates 15,000 pounds in three hours or on divisions of unusual length.

Again quoting Mr. Bartholomew, who has so carefully and thoroughly studied this subject:

"I also wish to make the statement that up to the present time no locomotives have been equipped with stokers which do not need them."

As practically all of the locomotives which have been provided with mechanical stokers attain or exceed the dimensions and requirements mentioned above, the facts justify his conclusions.

Assuming that 120 pounds of coal per square foot of grate per hour is required to obtain the capacity of the locomotives, the average coal rate for those covered in the tabulation would be as follows:

Mikado	Grate 70.5 sq. ft.	Coal per hour.....	8,460 lbs.
Santa Fe	" 83.0 " " " " "	9,960 "
Mallets	" 89.2 " " " " "	10,704 "

Evidently some locomotives of these dimensions are worked below the capacity suggested by the builders formula of 120 pounds of coal per square foot of grate area per hour or certainly there would be more stokers in use.

Even if half the amounts of coal per hour given above were to be fired by hand for any considerable length of time, it is probable that that limit of endurance of the men, especially during the warm seasons, would be approached and therefore the stoker will afford the required relief and will be accepted as a substitute for the second fireman so frequently requested.

In fact, I am inclined to believe that in time the stoker will be preferred, as by the use of the stoker the period elapsing from employment to promotion to engineman will not be increased which would be the case were a second fireman employed on all locomotives.

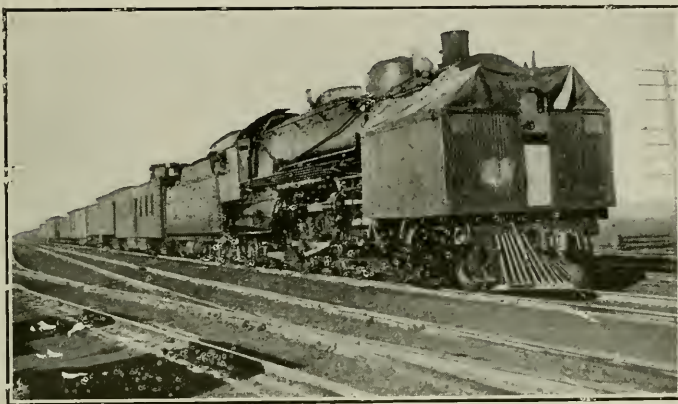
* * * * *

I have already stated that mechanical firing permits the working locomotives more nearly to maximum capacity than when fired by hand. Therefore, some examples of results obtained are presented to you.

As the following data has already been published, I feel

sure my friends of the Santa Fe will not object to my giving you the benefit of their work.

The tests were made with their dynamometer car and the locomotive and train ready for test is shown. The locomotive is a Mikado, having approximately 60,000 pounds tractive force. Numerous test trips were run to determine other factors as well as a comparison of hand and mechanical firing, but those shown in the following tabulation were for the latter purpose.



"SANTA FE" TEST TRAIN.

LOCOMOTIVE STOKES CO
PITTSBURGH, PA.

TONNAGE TESTS

BOILER PRESS 190^{PSI}

WEST BOUND

TEST NO.	TONNAGE	CARS	LOADS	ENGINES	RUNNING TIME	COAL USED LBS	EVAP.	DOCTON MILE	COAL PER M.T.M.	COAL PER HOUR	COAL PER SQ FT GR. PER HOUR	AVE STEAM PRESS.	HAND OR STOKER
7	2579	65	63	2	6 ^h 42 ^m	35,000	5.62	2819	24.2	5224	78.2	134.3	H
9	2713	69	60	9	5 ^h 48 ^m	35,500	5.58	2965	119.8	6121	91.3	178.8	S
11	2849	71	67	4	6 ^h 34 ^m	46,600	4.75	3114	149.7	7096	106.2	175.7	S
13	2835	74	58	16	5 ^h 40 ^m	38,083	5.39	3068	124.3	6721	100.6	177.0	S
15	2848	75	73	2	5 ^h 38 ^m	41,076	4.91	3061	136.8	7403	110.8	185.9	S
17	2896	56	56	0	5 ^h 53 ^m	43,300	4.73	3128	138.4	7360	110.7	185.8	S
19	2872	71	66	5	6 ^h 31 ^m	44,890	4.55	3102	144.7	6888	103.1	167.5	S
21	2869	65	65	0	5 ^h 28 ^m	35,600	4.76	3136	113.5	6512	97.7	183.6	S
23	3059	73	72	1	6 ^h 04 ^m	37,350	5.03	3343	111.7	6156	92.0	179.4	S
25	3061	65	56	9	6 ^h 10 ^m	38,250	5.57	3346	114.3	6203	92.9	181.2	S
27	2887	61	57	4	5 ^h 27 ^m	32,300	5.62	3146	102.7	5927	88.7	187.7	S

TONNAGE TESTS.

All of these trips were "Westbound" the direction of

heavy loaded traffic prevailing at the time, and shows the results obtained on one hand fired and ten stoker fired runs.

On the hand fired run No. 7 the coal consumption per square foot of grate area per hour was 78.2 pounds or 5.225 pounds per hour, or close to what I regard as the limit for hand firing for sustained periods.

On the ten stoker fired trips the coal consumption per hour varied from 6,000 pounds to 7,400 pounds.

Heavier trains were hauled on all runs made while using the stoker. The maximum increase being 482 tons or 18.3%, and even with the greater weight of train the running time was in all cases favorable to the stoker firing.

On the portions of the road where the tests were made there are against west bound traffic two 6/10% grades one thirteen (13) miles and the second eight (8) miles in length. During the day of one of the tests there were eight regular tonnage and one test train operated over these grades, and the time required to run over these portions of the line is shown.

LOCOMOTIVE STOKER CO.
PITTSBURGH, PA.

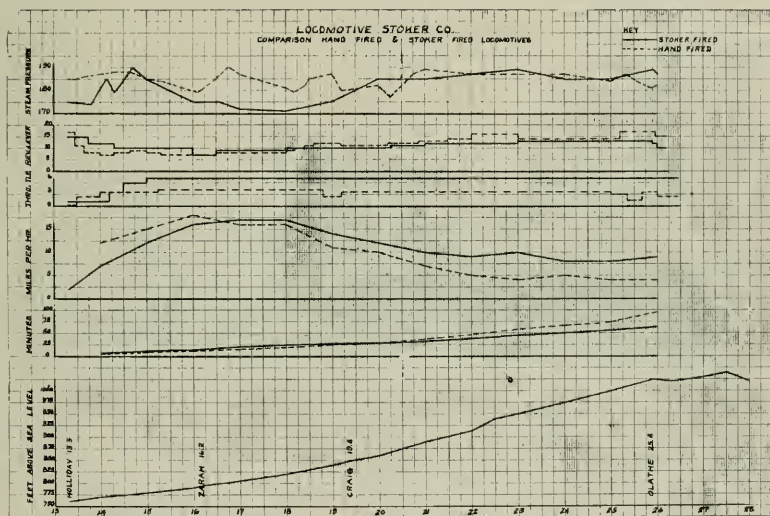
TIME ON GRADES - JAN. 19, 1919. - WEST BOUND. 8 REGULAR TRAINS AND 1 TEST TRAIN			
ENGINE NUMBER	GROSS TONS.	13 MILES 31.68 FEET PER MILE	8 MILES 31.68 FEET PER MILE
3211	1800	61 MIN.	30 MIN.
3202	2180	48 "	27 "
3207	1950	63 "	25 "
3209	2900	50½ "	31 "
3206	2120	75 "	32 "
3200	1945	46 "	31 "
3121	2000	58 "	SOUTH
3192	2285	82 "	"
3193	3350	54 "	"

TIME ON GRADES.

The fact that the 2,900 ton (test) train was taken up the 13 mile grade in 50½ minutes, while other similar locomotives hand fired with 500 tons to 1000 tons less train shows the value of the stoker in utilizing locomotive capacity.

To make a more definite comparison of the results of hand and mechanical firing, a hand fired trip was made with what we will designate as stoker tonnage, and the performance over the 13 mile grade carefully noted.

The diagram illustrates the results better than is possible by tabulation or description. It will be noted that the stoker fired locomotive was worked with full throttle during practically the entire trip and with shorter cut off than the hand fired locomotive. The running time for the 13 miles being 31 minutes in favor of the stoker locomotive.

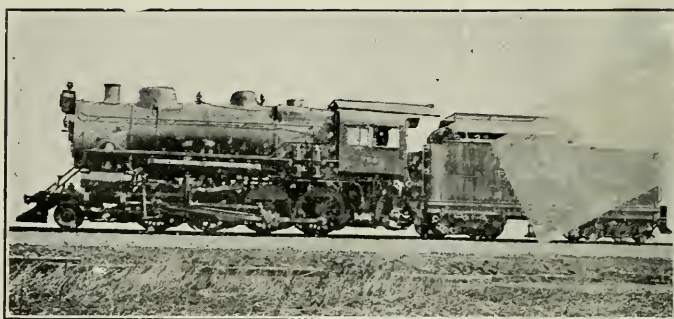


HAND AND STOKER FIRED TESTS ON 13-MILE GRADE.

The effect on traffic density is illustrated by the fact that on the day the hand fired trip was run, its slow time on the grade held back two other trains, which the higher speed attained by the 3209 would have prevented.

That the above is not an isolated case, I will refer to a similar test made some time ago on the Pennsylvania Lines. The tests were made with two locomotives, one of the type

shown with stoker and an exactly similar locomotive without stoker.

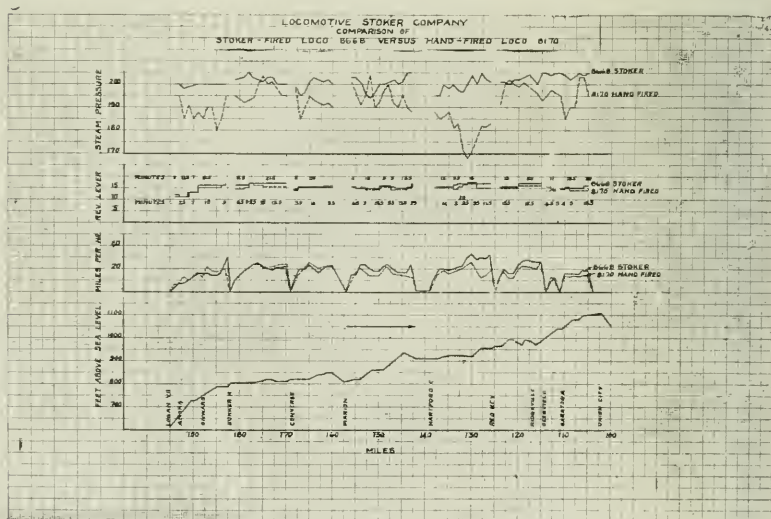


CONSOLIDATION LOCOMOTIVE PENNSYLVANIA LINES WEST.

These locomotives weigh 231,300 pounds on drivers, have a grate area of 55.13 square feet and 53,198 pounds tractive force.

In this test both locomotives were loaded to "Stoker rating," which was on this particular division fifteen (15%) per cent in excess of regular rating.

Really the results as shown need little comment. The speed, the cut-off, the steam pressure show exactly what



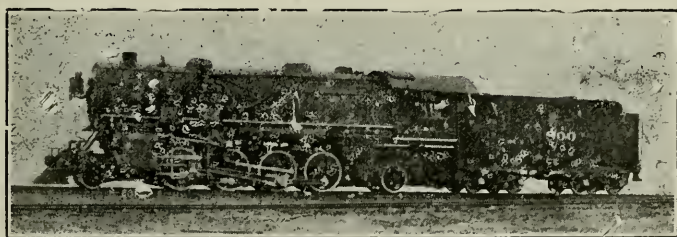
HAND AND STOKER-FIRED TESTS OVER A DIVISION.

might be expected from a well fed fire box compared with one that was starved, and the misused machine required about 11% more time to get over the division than the one properly supplied with fuel.

Let us all remember that the energy required to move trains is in the fuel and also to remember—"It is impossible to get something for nothing."

One more example of what an ample supply of fuel means to a locomotive to the Railroad owning it and the public seeking real transportation at low cost.

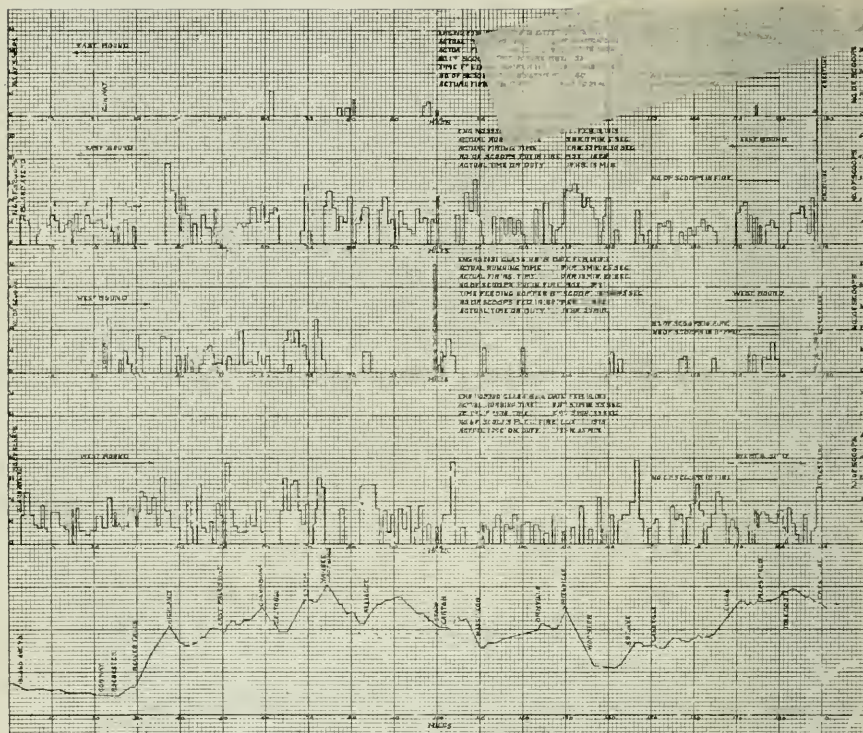
The locomotive illustrated operates between Russell and Silver Grove, Kentucky, and when hand-fired haul 4,800 tons, but with mechanical firing 6,000 tons. Is not a gain of 25% in earning capacity of value to any person, industry or community. Much more information on this point could be offered, but, with the large number of stokers in service, you will all have the advantage of personal experience to confirm the conclusions.



CHESAPEAKE & OHIO MIKADO LOCOMOTIVES.

In covering an ordinary division on the average locomotive used in freight service a fireman will handle from 1600 to 2000 shovels of coal and he will be engaged in supplying coal to the fire box 16% of the time on duty. Of course the maximum is much in excess of the figures given. That the use of the stoker materially alters the situation is disclosed by the diagram, which shows the number of scoops of coal supplied by hand on two hand-fired and two stoker-fired trips.

The number of scoops of coal shoveled throughout each trip is indicated by the vertical lines and the profile of the division is given at the bottom of the sheet.

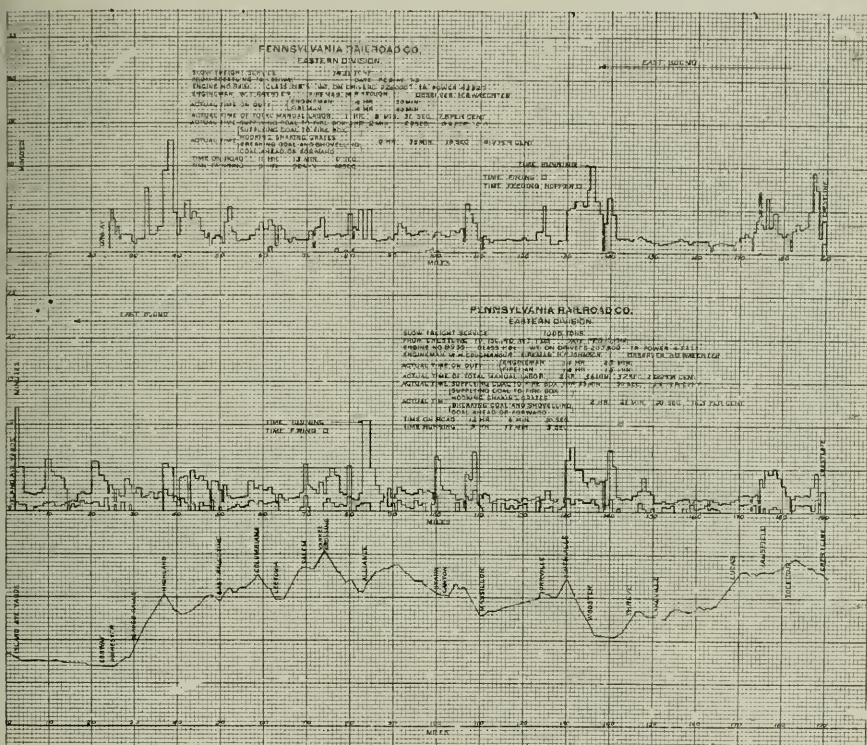


COMPARISON BETWEEN SCOOPS OF COAL FIRED BY HAND ON
STOKER AND HAND-FIRED LOCOMOTIVES.

As the figures are somewhat difficult to read, I refer briefly to them:

- 1st. Trip (Top) Stoker-fired—Scoops of coal fed to fire-box by hand 52—Fed to stoker hopper 40=98.5% stoker trip.
- 2nd. Trip (2nd Line) Hand-fired—Scoops of coal fed to fire-box 1624.
- 3rd. Trip (3rd Line) Stoker-fired—Scoops of coal fed to fire-box by hand (313) fed to stoker hopper (332) =85% stoker trip.
- 4th. Trip (4th Line) Hand-fired—Scoops of coal fed to fire-box 1976.

To present this information from another viewpoint, record was kept of the time the fireman was occupied in manual labor during the trips and the chart shows the proportion of the time the fireman was at work:



COMPARISON OF TIME OCCUPIED IN SUPPLYING COAL TO FURNACE BY HAND. STOKER AND HAND-FIRING—EASTBOUND TRIPS.

Hand-Fired—On duty 14 hours and 15 minutes.

Supplying Coal to Fire-Box—1 hour and 59 minutes.

Stoker-Fired—On duty 14 hour and 40 minutes=(98.5%)

Supplying Coal to Fire-Box—2 minutes and 23 seconds.

The remaining trips are shown below and the figures are:

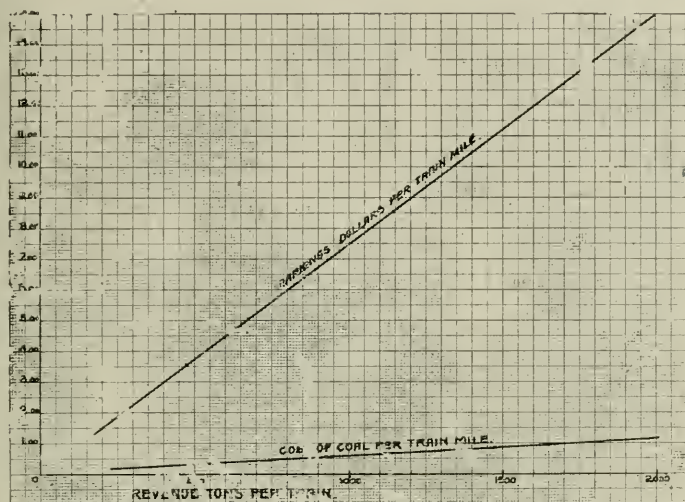
Hand-Fired—On duty 13 hours and 35 minutes.

Supplying Coal to Fire-Box—2 hours and 5 minutes.

Stoker-Fired—On duty 15 hours and 59 minutes=(85%).

Supplying Coal to Fire-Box—13 minutes and 21 seconds.

The relation between earnings per train mile and expense for coal per train mile, taken from the annual report of one of our largest railroads is given for your consideration.



RELATION BETWEEN EARNINGS AND COST OF COAL
PER TRAIN MILE.

* * * * *

It is to be expected that in the application of some five thousand mechanical stokers in the past ten years that many questions have arisen regarding the desirability of extending their use as well as questions relating to details of their efficiency and requirements.

Of the many questions brought to the writer's attention, two stand out prominently:

First—Fuel Economy.

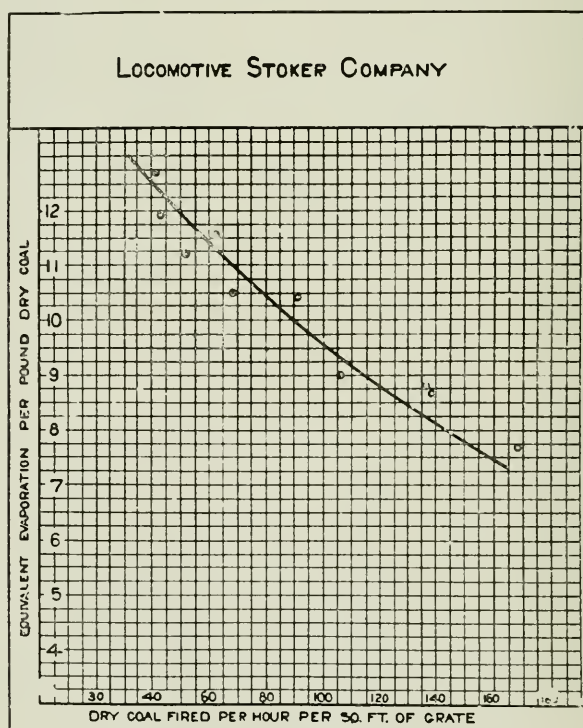
As it is evident that only the furnace efficiency is affected, whether a boiler is fired manually or mechanically, many of the tests which have been made must be disregarded, as the results obtained clearly indicate failure to differentiate between furnace, boiler and engine efficiency.

Indeed I can only conceive of one reason why under equivalent draft, structural and adjustment conditions why a manually fired furnace should show a better performance

than a mechanically fired furnace. That is, that firemen might be able to more accurately distribute the fuel supplying the fresh coal exactly to the points on the grate required, as indicated by the color of the fire, and I can only think of one reason why the mechanically fired furnace should give the better results, namely, it is unnecessary to so frequently open and close the furnace door, permitting a more uniform fire-box temperature to be maintained.

It is probable that in locomotive practice each of these theoretical advantages offset the other, especially at combustion rates approaching the limits of manual firing, beyond which the mechanical device is the superior due to the fact that accurate distribution can no longer be made.

The equivalent evaporation per pound of coal depends on the amount of coal burned per square foot of grate per

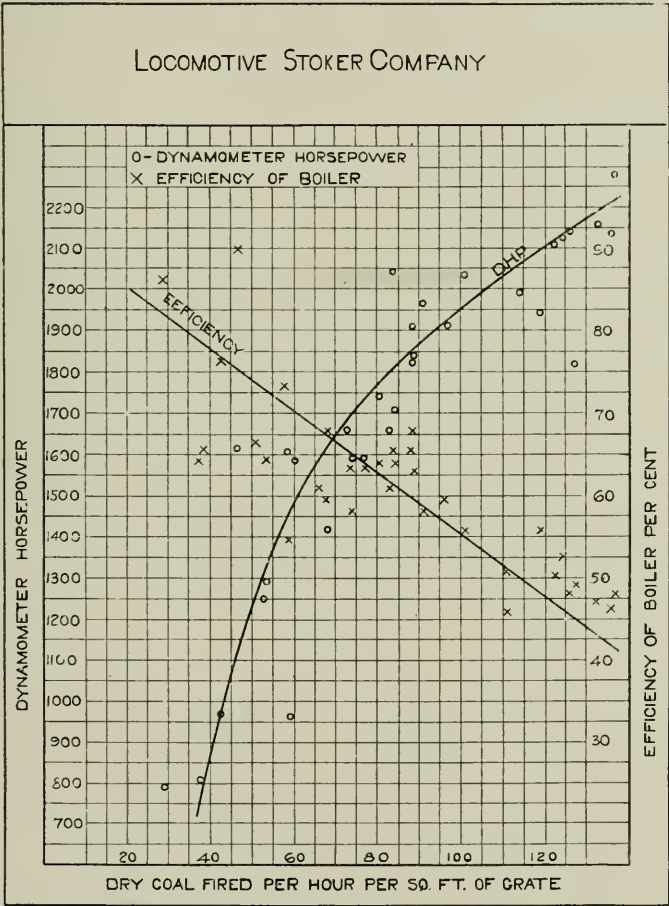


INFLUENCE THE RATE OF FIRING HAS UPON EVAPORATION.

hour rather than whether the furnace is fed manually or by a mechanical device.

The diagram illustrates graphically the relation of the rate of evaporation and the amount of coal burned per square foot of grate, and as the tests from which this data was obtained were all hand-fired, it shows clearly that the reduction in evaporation is not a function of the method of firing.

As the stoker is applied for the sole purpose of amplifying the output of the locomotive by causing more coal to give up the power contained therein, it follows that evapora-



BOILER EFFICIENCY AS RELATED TO HORSEPOWER OUTPUT.

tion rate will decrease in proportion to the combustion rate obtained.

The relation of the power obtained to the combustion rate and the boiler efficiency is made apparent by the diagram. This diagram indicates what we must understand and acknowledge to be the apparent sacrifice that is made to obtain the maximum capacity from the locomotives.

The coal consumed per gross ton mile cannot be considered an accurate measure of the difference between mechanical and manual firing, as not only is the efficiency of the boiler and engine variable factors, but the resistance of the train as determined by the number and weight of the cars must be given consideration.

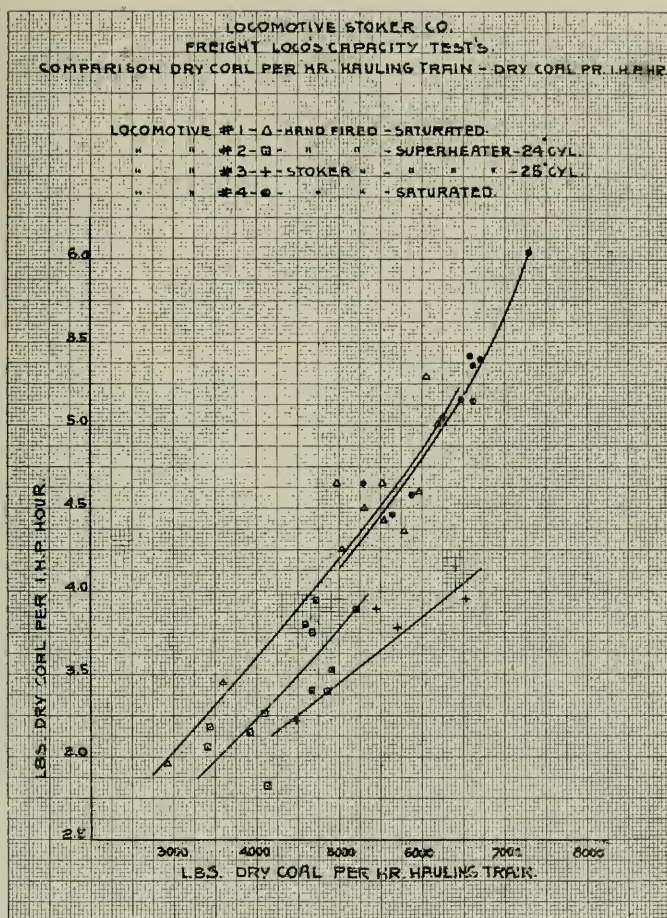
The unit ton miles, while sufficient for rough comparisons, should not be depended upon when definite information is required.

Although it is true that the "Pounds of Coal per Indicator Horsepower Hour," also involves the performance of the cylinders, by careful selection of the locomotives, as to similarity in engine conditions, this unit may be regarded as fairly valuable in making comparisons.

The diagram shows the results of some tests where the information obtained is compared on the last mentioned basis.

It will be noted that for the higher rates of combustion, and consequently lower boiler efficiency, that the curves indicate that coal consumption per indicated horsepower hour favors the stoker-fired locomotive, also that when superheated steam is used there is a marked difference in favor of the mechanically fired locomotive. In the latter case, however, the excellent results shown were obtained by increasing the diameter of the cylinder equal to about 10%, as it was found that with the stoker this could be done on account of the ample steam supply. Indeed further experiments justified further increasing the diameter of the cylinders equal to about 17% with proportionate gain in hauling capacity.

A possible increase of 17% in the earnings per train mile is surely sufficient to be attractive to those responsible for the financial results of Railway operations and to justify the application of a device which permits such conditions.



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COMPARISON OF COAL USED PER INDICATOR HORSEPOWER HOUR,
HAND STOKER FIRING.

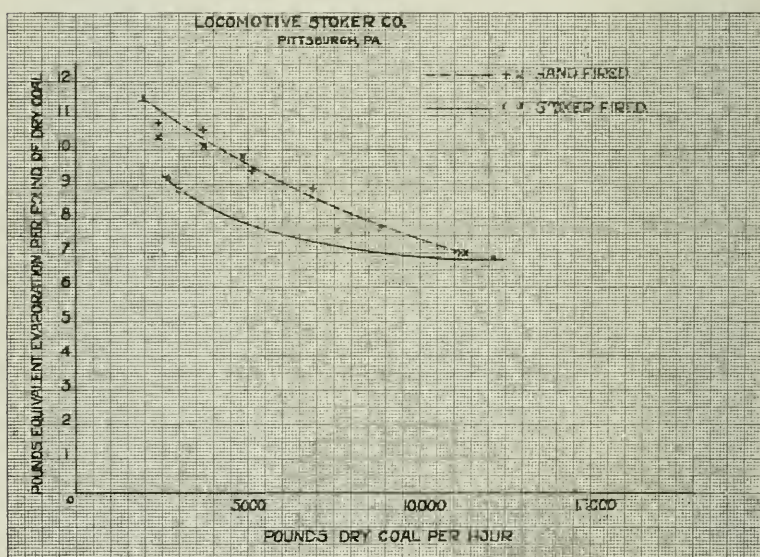
Frequently the statement has been made to me that the coal required by stoker-fired locomotives is from 15% to 25% in excess of that required by those fired by hand when equivalent work is performed.

Evidently this impression is based on tests or information when all of the controlling factors have not been given consideration, as

- (a) The relative rate of firing and consequently the boiler efficiency.

- (b) The relative size of coal used with the difference in stack losses.
- (c) The relative experience of the fireman in hand and stoker-firing.

On one test when a comparison of the evaporation obtained was made the results are illustrated by the diagram from which you will observe that while at the lower rates of combustion there was some difference in favor of the hand-firing, the amount gradually decreased as larger quantities of coal were used.



EVAPORATION—HAND AND STOKER-FIRING.

A very interesting example of the effect of factors other than evaporation in making comparisons of mechanical and manual firing was when on two trips over the same division with similar tonnage, all conditions being duplicated, as far as possible, except that on one trip the locomotive was hand-fired and on the other trip stoker-fired.

With almost identical water consumption and coal consumption for the two runs, the stoker-fired locomotive covered the division in seven hours while eleven hours was

required on the hand-fired run. Of course the trains in both cases were what might be termed stoker rating.

More complete data on this subject is of course desirable, and I feel sure that all of the stoker manufacturers will gladly co-operate with the railways to obtain it.

How many of us have taken the trouble to ascertain the effect in coal consumption of inexperienced firemen.

The tabulation gives the results obtained on some tests made to develop the facts. It will be observed that the difference when the locomotive is doing the same work is 22%.

LOCOMOTIVE STOKER CO.
PITTSBURGH, PA.

TRIALS OF COAL - CHICAGO DISTRICT

ALL TESTS AT 80 r.p.m., -14.56 m.p.h., -26 per cent CUT-OFF
LENGTH OF EACH TEST, 2 HOURS

Coal	Average Boiler Pressure		Total Coal		Total Water		Steam Lost At Safety Valve		Average Smoke PerCent		Brick Arch
	Ex.	Inex.	Ex.	Inex.	Ex.	Inex.	Ex.	Inex.	Ex.	Inex.	
Macoupin	199.5	198.7	6528	7757	19145	38571	0	144	30	42	None
Williamson	205.8	205.4	5752	5568	39727	41482	174	678	24	20	"
Williamson	204.5	204.5	5970	5284	42874	43457	504	2992	14	18	Arch
Sangamon	205.1	142.8	5897	*2887	40077	*16436	0	0	18	52	"
Green	206.0	204.3	5264	6442	41052	41042	154	1344	8	28	"
Vermillion, Ill.	204.2	204.6	5764	7465	40557	44519	304	4804	22	34	"
Vigo	204.6	203.8	5480	6057	39782	40807	632	318	20	22	"
Vermillion, Ind.	205.4	205.2	5446	6675	40874	42534	78	288	15	28	"
Sullivan	203.2	203.2	5557	8192	39514	42734	0	2338	28	82	"
Saline	206.0	204.3	4908	7253	40232	42826	556	3132	24	84	"
Marion	205.0	184.1	6146	7632	40006	35393	240	852	14	30	"
TOTAL	2044.1	2016.3	56824	58306	403762	413365	2542	16390	200	334	
Average	204.4	201.6	5682	5831	40376	41337	254	1639	20	33.4	
Percent Excess				22.0				541.3		67.0	

EX - Experienced Fireman

INEX - Inexperienced Fireman

* - One Hour Test

In the total and averages the figures for Sangamon Coal have intentionally been omitted, as two inexperienced firemen failed to maintain the boiler pressure on a one-hour test.

RESULTS OBTAINED WITH EXPERIENCED AND INEXPERIENCED
FIREMEN (HAND-FIRING)

Did it ever occur to you, that there are really very few experienced stoker firemen. Why should you expect the same results from inexperienced stoker firemen that you obtain from experienced hand firemen, when with firemen of equal skill handling the stoker and the shovel show that more coal is being used on the mechanically fired locomotives you may rest assured that you are getting a return for it either in increased tonnage or increased speed.

You have no doubt noticed that I have said nothing about fine coal and stack losses. This was omitted as I propose to present to you some information on this subject in connection with the second question, but before doing so it is desirable to bring to your attention some information regarding a minor point sometimes considered in connection with fuel economy, namely the steam jet.

As you know, four of the six types of stokers for locomotives now in service use steam jets to project the coal into the fire-box.

It has been stated that the introduction of steam into the fire-box for this purpose results in decreased evaporative efficiency. Just what has led to these statements I am at a loss to understand, as very early in my railroad experience I was informed as to the desirability of wetting the coal to improve the combustion, and we are all familiar with the wide use of steam jets in stationary boilers, especially those equipped with certain types of mechanical stokers.

In 1912-1913 tests were made under the direction of the General Managers Association of Chicago to determine the effect of steam jets on the amount of smoke emitted from a locomotive, and of course one of the factors was the effect on fuel economy.

From the results of these tests published by the American Railway Master Mechanics Association the data shown in the tabulation was obtained, and the data supplemented by the following statement: "The tabulated results of the efficiency tests with Pennsylvania Gas Coal (Tests Nos. 2500-79 to 2500-87) with and without the jets are plotted. The curves show that a reduction of smoke results in an increase of equivalent evaporation, and a corresponding increase in

efficiency and economy with or without the brick arch, showing that the steam jet tubes make for improved combustion and economy rather than simply to "whitewash" the smoke."

LOCOMOTIVE STOKER CO.

EFFECT OF STEAM JETS ON EVAPORATION.

TEST NO.	COAL FIRED PR. HOUR		STEAM THROUGH JETS - LBS		EQUIV. EVAP. LBS.	% LBS. STEAM TO LBS. COAL.
	TOTAL	D ^{PT} GRATE	PR. MINUTE	PR. HOUR.		
WITHOUT BRICK ARCH.						
79	2025	69.5	7.56	453.6	8.7	22.3
80	1786	61.3	12.97	778.2	9.8	43.5
81	827	62.7	0	0	9.3	0.0
82	1961	67.3	13.78	826.8	8.9	42.0
83	1961	67.3	17.64	1058.4	9.1	54.0
WITH BRICK ARCH.						
84	1820	62.4	17.64	1058.4	9.7	58.5
85	1692	58.0	7.56	453.6	10.4	26.6
86	1811	62.1	0	0	9.5	0.0
87	1784	61.2	13.78	826.8	9.5	46.2

SPEED - 12 MILES PR. HR. - FULL THROTTLE - 25% CUT OFF.

M. M. ASSN. VOL. XLVI - 1913. PAGE 345.

EFFECT OF STEAM JETS ON EVAPORATION.

With this evidence before us I do not think for the present at least we need be concerned as to the deleterious effect of using steam jets for projecting the fuel into the fire-box, for if the use of as much as 1000 pounds of steam per hour with 2000 pounds of coal per hour does not result in reduced economy, certainly the introduction of from 300 to 500 pounds of steam per hour into a fire of 5000 to 7000 pounds of coal per hour will not adversely affect either the evaporation or the annual balance sheet of the Railways using this arrangement.

Second. Prepared Coal.

We all appreciate that one of the arguments for the introduction of the locomotive stoker was the possibility of using the less expensive grade of coal known as screenings or slack coal and consequently a number of stokers especially adapted for its use were installed. As the number of stokers of this type increased the limitations imposed upon their use by requiring special coal quickly developed and the Railways not only felt this handicap but in many cases had to fire

the locomotives by hand, and in some instances had to employ two firemen in a single stoker equipped locomotive on account of the fact that coal of a suitable size was not available.

Not only were the Railways embarrassed by this condition, but, as might be expected, the amount of fuel required was greatly augmented. Surely we all remember from our firing days what it meant to have a tank of fine coal and the report made at the end of the trip—"Not steaming poor coal."

Of course it was expected that the decreased cost per ton would offset the increased consumption, but the practical difficulty not only of supplying the special coal but the necessity of carrying two kinds of coal at coaling stations, one for hand and one for stoker-fired locomotives, indicated the advantage of a stoker so arranged that it would handle run of mine or even lumps by breaking it to a suitable size on the locomotive.

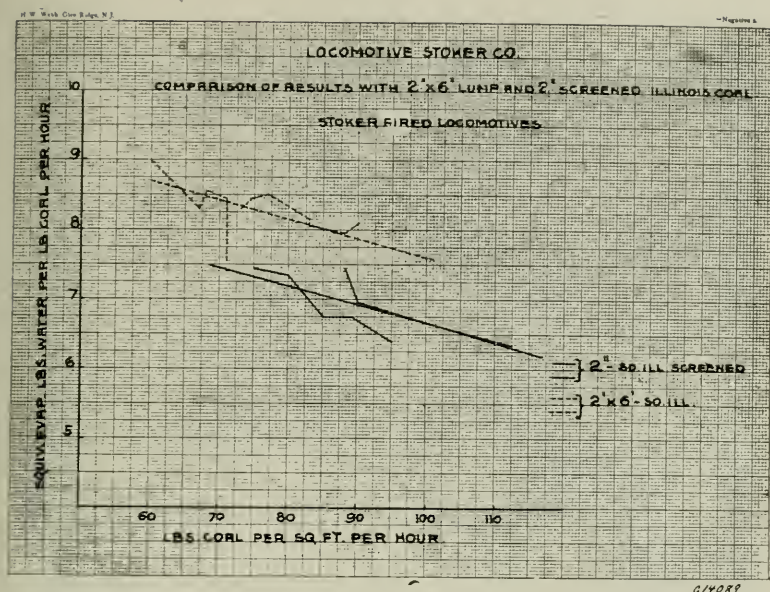
During almost the entire war period it was difficult to obtain screenings and at the present time with the possibility of a coal shortage due to the numerous strikes, the value of a device with which any kind of coal available may be used will be appreciated.

There is, however, a much more important reason for avoiding the use of screenings or coal of small size than the inconvenience of providing it prepared or crushing it at the coaling stations. That is, the question of quantity used.

The illustration before you shows the results obtained on some tests recently made on stoker-fired locomotives when on one series of tests coal which would pass through a two (2) inch screen was used and the other series made with coal which would pass through a six (6) inch but over a two (2) inch screen, in the latter case the larger lumps being reduced by the breaker in the stoker conveying mechanism.

The advantage obtained in using the larger coal is apparent and amounts to over 15%.

In all of my stoker work I have insisted that the stoker be arranged to break the coal to suitable size (and the pro-



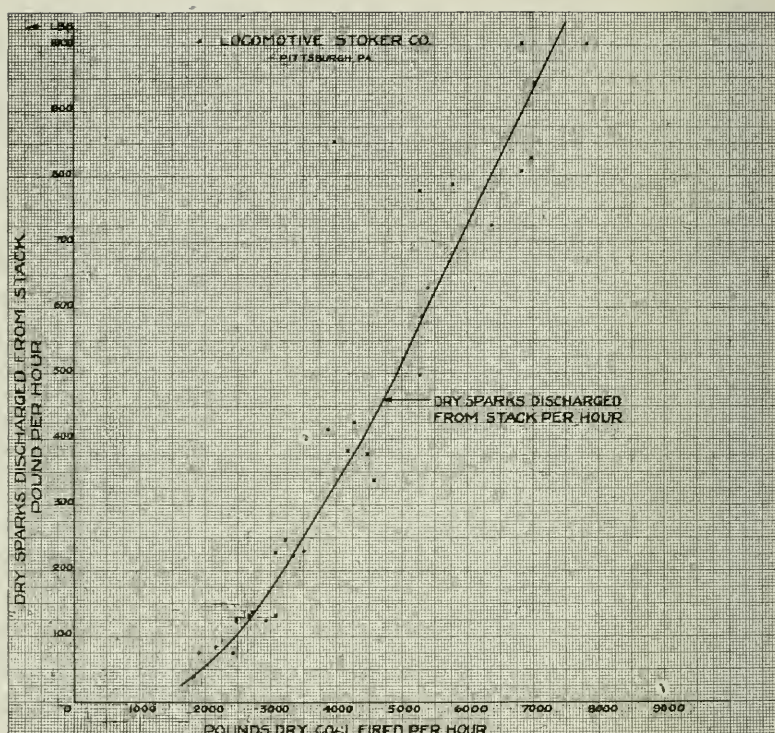
COMPARISON OF EVAPORATION OBTAINED WITH LUMP COAL
AND SCREENINGS—STOKER-FIRED.

portion of fine coal should be kept as low as practicable), as my early experience clearly indicated the advantage in economy and my knowledge of operating conditions taught me to avoid anything that reduced the flexibility of the locomotive as a transportation unit, such as depending on screened coal or coal crushers installed at coaling stations, which not only involve complications, but introduce another element of transportation losses if for any reason they may become inoperative.

The principal cause no doubt of the decreased efficiency of the finer coal is the loss due to the unburned coal being thrown out of the stack. The amount of this loss of course depends upon the rate of firing and the relative fineness of the coal.

The diagram shows only the relation between the stack losses and the rate of firing.

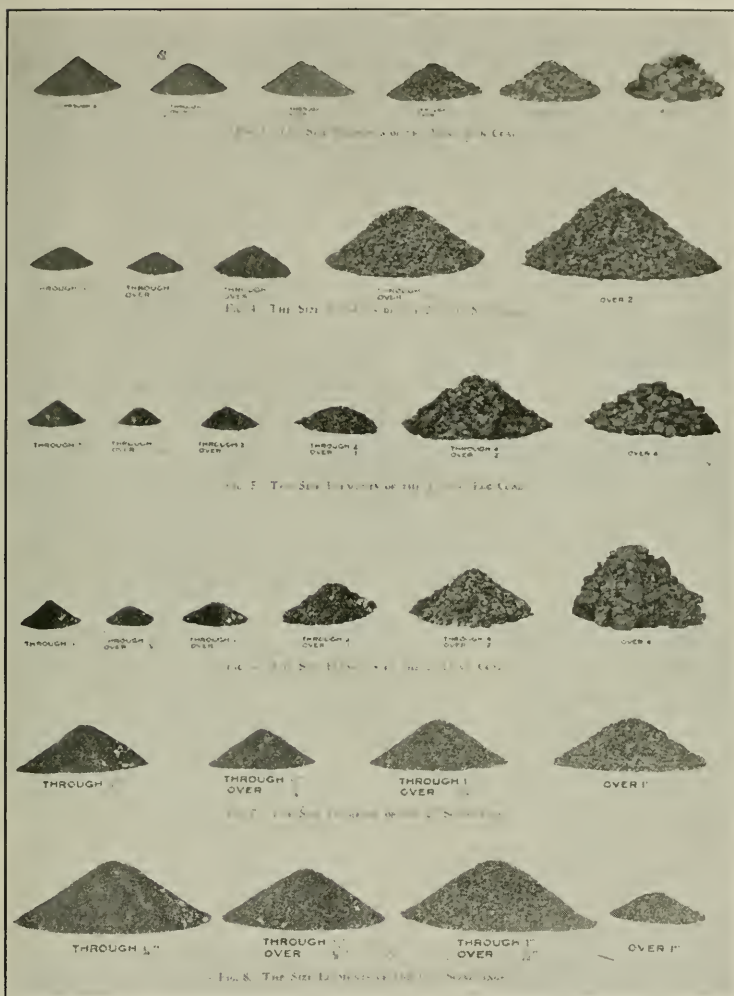
The stack losses, which run as high as 15 to 20% of the coal fired, have no other relation to the method of firing



RELATION BETWEEN RATE OF FIRING AND STACK LOSS
(HAND-FIRING).

except that it is the usual practice to fire at higher rates mechanically than manually.

The effect of the size of the coal on stack losses has been shown by extensive tests made at the University of Illinois.



THE SIZE ELEMENTS OF VARIOUS GRADES OF COAL.

The illustration before you shows the proportion of the various sizes of coal in each of the tests, the results of which are disclosed in the tabulation.

LOCOMOTIVE STOKER CO.
PITTSBURGH, PA.

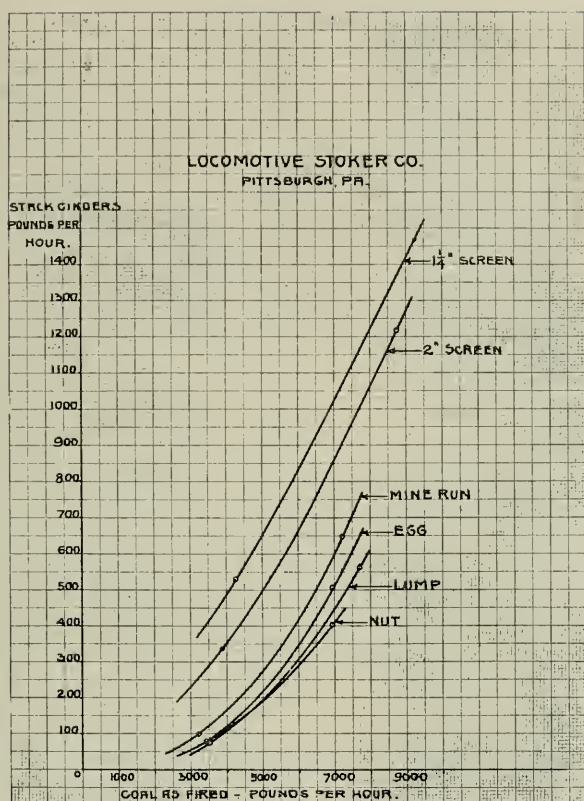
TEST NO.	SIZE OF COAL	R.P.M.	CUT OFF %	LBS. COAL AS FIRED PER HOUR	STACK LOSS - % OF TOTAL COAL AS FIRED	ASH FROM ASH PAN. TOTAL COAL AS FIRED	ANALYSIS ASH IN COAL %	S.H. STEAM LBS. PER POUND OF COAL AS FIRED	EQUIVALENT EVAPORATION PER POUND OF COAL AS FIRED
				SQ. FT. OF GRATE AREA	GRATE AREA				
2400-2401 2402	MINE RUN	100	33	45.8	3.1	4.4	9.63	7.06	9.31
2405-2406 2429	"	135	55	103.2	9.0	6.7	9.89	5.88	7.95
2408-2409 2426	NUT	100	33	49.5	2.3	5.3	9.07	6.84	9.07
2412-2413 2414	"	135	55	99.8	5.7	5.0	8.61	6.12	8.30
2415-2416 2423	EGGS	100	33	48.7	2.2	5.4	8.19	7.04	9.30
2420-2422 2424	"	135	55	99.9	7.2	7.1	7.23	6.18	8.39
2417-2418 2419	LUMP	100	33	50.6	2.1	7.9	9.36	6.80	9.00
2425-2427 2428-2442	"	185	55	110.0	7.4	7.7	8.85	5.68	7.57
2430-2434 2435	2 INCH SCREEN	100	33	53.3	8.9	4.0	10.50	6.32	8.39
2436-2437	"	135	55	124.6	14.1	5.0	10.72	4.96	6.74
2431-2432 2433	1 1/2 INCH SCREEN	100	33	61.0	12.5	4.7	10.14	5.84	7.75
2440 2441	"	135	55	132.5	16.1	4.3	11.21	4.72	6.36

STACK LOSSES AS RELATED TO SIZE OF COAL AND
RATE OF FIRING.

From long experience, knowing how difficult it is to read tabulated statements, I present a diagram which shows accurately the relation existing between the stack losses and the several sizes of coal fired and this is shown graphically in the diagram.

Again I quote Mr. Bartholomew:

"..... that in order to use slack coal for locomotive fuel economically, there should properly be a difference in price (in favor of the writer's) between the coarser coal and slack coal to compensate for the

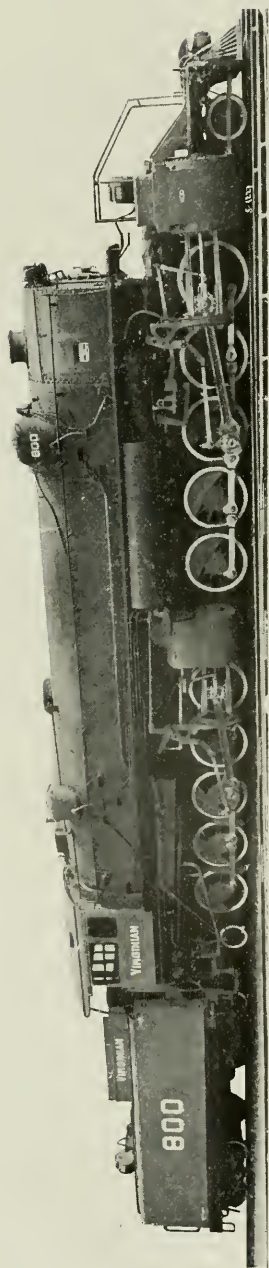


INFLUENCE OF THE SIZE OF COAL AND RATE OF
FIRING ON STACK LOSSES.

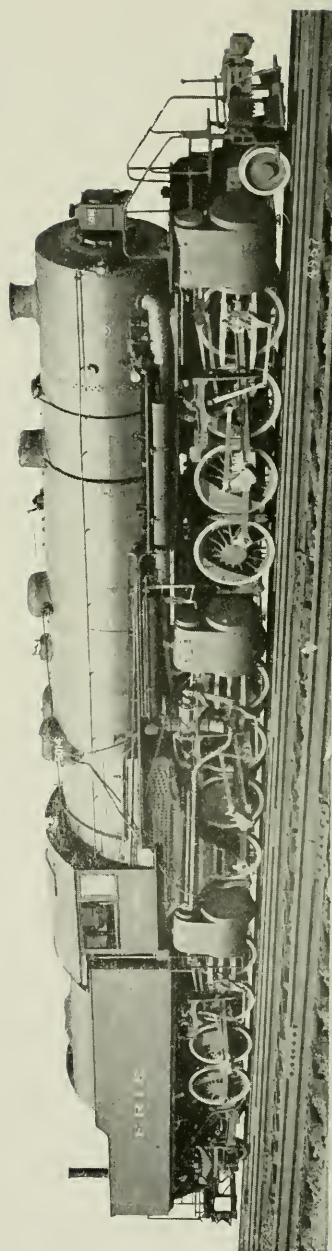
lower economies that result from firing fine coal at high rates of combustion."

After the most careful consideration of the subject I cannot conceive of any reason why any one should desire to provide expensive installations of coal crushers and complicate coaling stations and operating conditions to insure a lower locomotive efficiency and increase the cost of transportation, not only by the cost of installation of the apparatus and the additional coal, but the expense of cleaning the ballast to permit of proper drainage of the track structure.

In 1913 in the Convention of the American Railway



VIRGINIAN 2-10-10-2 MALLET LOCOMOTIVE.

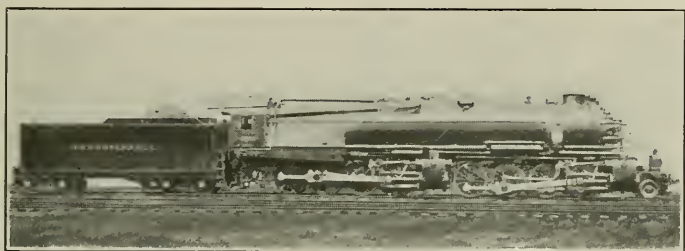


ERIE TRIPLEX LOCOMOTIVE.

Master Mechanics Association I made the following statement:

"I see before us a locomotive still larger that must have a stoker because it will require so much more coal per hour to supply the steam."

Surely the Virginian Railroad in their 2-10-10-2 the Erie Triplex which should use 15,000 pounds of coal per hour, and my friend and former colleague, Mr. J. T. Wallis, with his simple Mallet which has 112 square feet of grate and 130,000 pounds tractive force, have entirely made good my prediction or my dream as you prefer to call it.

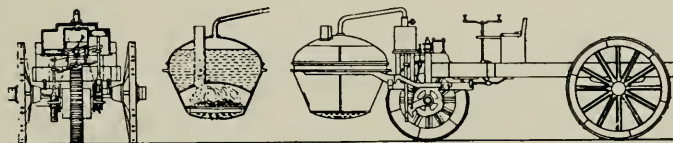


PENNSYLVANIA RAILROAD MALLET LOCOMOTIVE.

Should we not at this time pause to consider what has led to these wonderful machines.

One hundred and fifty years ago, or in 1769, there came from an officer of the French Army the device by which the first propulsion on land in the world was attained.

Nicholas Joseph Cugnot, a native of Vord in Lorraine, forty years of age, having served in both the French and German Armies, in the latter as engineer, led by the desire to move artillery more rapidly than was possible by animal power, produced the first practical self propelled vehicle, an outline of which is now displayed.



Cugnot's Locomotive 1771.

CUGNOT'S LOCOMOTIVE.

Do you realize, Gentlemen, that the picture represents the machine, the inception of which not only made possible that wonderful system of land transportation, the railways of the world, but is also the predecessor of the splendid and efficient automobile or motor cars used in city streets or common roads.

The locomotive which was tried in 1771 had three wheels; two carrying wheels and one driving wheel; the latter 50 inches in diameter with a tire seven (7) inches wide, two single acting cylinders thirteen (13) inches in diameter and weighed in working order twelve (12) tons and carried four persons. The operating speed was two and one quarter ($2\frac{1}{4}$) miles per hour.

It developed five (5) horsepower, equivalent to a tractive power of 830 pounds. Owing to the small capacity of the boiler (and not having a stoker) it could not continue to work more than 15 minutes when it was necessary to stop and get up steam. One day when turning a corner of a street near the Neadeline in Paris, when the machine was running about three (3) miles per hour it upset and being considered dangerous it was locked up in the arsenal. It is now in the Museum des Conservatoire des Arts et Metiers in Paris.

M. Cugnet was awarded the Cross of the Legion of Honour and pensioned. What would of happened had it been known that his design would lead to the larger ones just shown.

In conclusion will you be good enough to let me speak to you as though the mechanical stoker were talking.

Please remember:

- 1st. That I am a mechanical device.
- 2nd. That I will only do what a human being makes me do.
- 3rd. That I cannot tolerate neglect.

and I beg of you to heed the following admonitions:

Inspect me.

Lubricate me.

Maintain me.

Operate me.

and for all these I will add to your earnings and your comfort and banish NOT STEAMING.

PRESIDENT: Gentlemen, the paper which has just been read is now open for discussion. In view of the very interesting facts and figures brought out by the speaker I do not think it will be necessary to put prods into you gentlemen to get up and speak, but just in order to be assured that we will get well started I am going to ask Mr. L. H. Turner, our old friend and Superintendent of Motive Power of the P. & L. E. to open the discussion. If he is not here he has a substitute, Mr. Redding, who will have to represent him.

MR. REDDING: Mr. Chairman and Gentlemen: I cannot criticise Mr. Crawford's paper, it is the best one we have had before the Club for a good many years on an up-to-date subject, one in which we are very much interested. There are, of course, stokers and stokers. Mr. Crawford has not told us what stoker he is talking about particularly, but we can guess; and I understand on the railroads where the stoker he has been referring to are in operation, they are giving very splendid results at low cost of maintenance. Of course, there has been a lot of argument about the necessity for stokers on certain equipment, as referred to by Mr. Crawford, and the formulae which they have given sounds very reasonable. These are, I think, the result of very careful consideration and the average railroad can be guided by those proportions in deciding whether a stoker is necessary or not.

The figures shown on the charts will require considerable thought and future study in order to fully understand them, at least they will for me, because I did not have the right kind of glasses to read them at this distance, and I see there are a number of other old fellows here in probably the same fix. But I believe we can accept them as being authentic and as showing considerable study on the part of Mr. Crawford and his associates who have done so much toward developing the stoker. Not having any personal experience with the type of stoker he has undoubtedly referred to, I am not prepared to talk about any of the

difficulties which may arise in their operation, and I believe that would be a very good subject to bring up by those who have had experience with such stokers.

For fear we might overlook it, or somebody else steal my thunder, I am going to take this occasion to say that I believe that this is one of the best papers ever presented here, if not the best, and represents a great deal of study and thought, and I feel that this Club should extend a vote of thanks to Mr. Crawford for presenting the subject in such a complete and entertaining manner. I offer that as a motion.

The Motion was seconded and unanimously carried by a rising vote.

PRESIDENT: Mr. Crawford, you have seen the result of this motion.

MR. CRAWFORD: I appreciate it very much, I am very glad to have had the opportunity.

PRESIDENT: Of course that motion usually comes a little later, but Mr. Redding is always just a little bit in advance, so we are not going to let that phase us in the discussion. When I took a trip abroad in 1914, so far as I know, there were practically no mechanical stokers on the Pennsylvania Railroad, that is on the Lines East, except a few experimental ones, and when I got back I found quite a large number of heavy dekapod locomotives equipped. Most of them I think are operating on the Pittsburgh Division and I think it would be interesting to have a representative of that division tell us the results obtained from this stoker and compare it, if possible, with the ones not so equipped. I am going to ask Mr. W. L. Hudson, Road Foreman of Engines of the Pittsburgh Division to favor us with a few words.

W. L. HUDSON: We have approximately 100 large locomotives Class I-Is, equipped with mechanical stokers. We had one locomotive of this class, (an experimental locomotive) that was not equipped with a stoker. We did not get very good results from this experimental locomotive, but we are getting excellent results from the later locomotives

and the ones that are equipped with mechanical stokers. I am not prepared to say how much more tonnage we can haul with one of these locomotives equipped with a mechanical stoker than with a locomotive of the same class not equipped. We have no trouble in hauling full tonnage with these locomotives. We have very few steam failures and very little stoker trouble. I was particularly impressed with the truthfulness of the stoker. You must not abuse it; you must keep it well lubricated; you must inspect it; you must keep it in repair. If you do these things, it will do all you ask of it. Do not feed it spikes, pieces of iron nor pieces of wood. Feed it coal and it will do its work.

PRESIDENT: I guess I will have to start the old game, I am not going to keep it up very long, because as a matter of fact I notice a great many new faces here since the last time I had the pleasure of attending a meeting of the Club; consequently, you gentlemen will have to help me out and get on the job yourself. I see Mr. John R. Alexander, General Road Foreman of Engines of the Pennsylvania here, I think he must have something to tell us about stokers. Mr. Alexander.

MR. J. R. ALEXANDER: Mr. President, of course I was interested in listening to the paper as read by Mr. Crawford, but I have had some experience on the opposite side of the table with Mr. Crawford, and would not try to make any objections to the contents of the paper unless I was mighty well loaded. I am pleased to say, however, that there is but little room for objections or argument against the facts as read here tonight. We have, as stated by Mr. Hudson, a considerable number of locomotives equipped with stokers. These engines (2-10-0) are rated at 24% more tonnage than the next lower class, (2-8-2) without a stoker. Unfortunately, we do not have the same type of engine in service both with and without the stoker, but comparing between conditions as they are, it does not seem that the 1-Is engine could handle much additional tonnage due to the application of stoker, and would hesitate to promise 15% greater tonnage due strictly to stoker-firing. Furthermore, the value of the stoker machine would seem more largely an advantage by reason of the difficulty experi-

enced to maintain a light and bright fire over any fire-box having from 70 to 115 square feet, and just remember fire-boxes and combustion chambers are more likely to increase in size than remain as they are now, and from the operating standpoint, the coming big factor to keep in mind is the time element. Engines must get their trains over the road in much less time than now would appear practical. It is even now a pretty big job to shovel coal and maintain a good fire over these large grate surfaces when engines are working hard enough to burn 5,000, 6,000 or 10,000 pounds of coal per hour, and no doubt we must still learn many new and efficient methods for handling stoker fires, and the sooner some of the old practices are discarded and new ones adopted, the better.

I am in sympathy with the thought that the stoker has already proven that the supposed big engine of today will in the near future be succeeded by a much larger and more efficient engine, as well as stoker apparatus. There is no doubt but that there will soon be many more of the large simple mallet type of engines in service, as was shown on the screen, and by that time stoker-firing, either by mechanical improvements or manipulation, should make less smoke, burn less coal, both on the road and at engine terminals, than they now do or would if fired with the shovel.

There will be much in the paper as read worthy of careful study when published in the Proceedings, and that is about the only way that I will be able to analyze the facts and figures outlined in the very interesting data submitted.

PRESIDENT: Is Mr. McNulty here yet, or did he slide out?

MR. F. M. McNULTY: Mr. President, I haven't anything to say in particular, I see them operating but know but little about them. I think the man back of me ought to have something to say.

MR. M. H. LAYLIN: Mr. Chairman and Gentlemen of the Club: We have 20 locomotives, overhead stokers, burning coal, which will pass through a 15/8-inch screen. We have 20 Mikados equipped with standard stokers and

we also have 10 Mallets equipped with standard stokers, using R. of M. coal. So we have none that have been described by Mr. Crawford. I am not prepared to give you anything on the economy of cost of operating stoker-fired engines as compared with hand-fired on large locomotives, that is the mallet type. We made some comparisons on engines of sixty thousand pounds tractive power hand-fired and other engines of sixty thousand pounds tractive power stoker-fired. The result was very much in favor of the hand-fired locomotive, but that was at a time when stokers were new and it wasn't a fair comparison. I don't think the engine crews and firemen were at that time using the stokers as economically and efficiently as perhaps they would now, after becoming more familiar with them. In accordance with Mr. Crawford's statement you must take care of them, and we find that mechanics that are capable of doing that work are hard to find. We have to get one, break him in until he is able to repair them properly. But with stokers in good condition, well taken care of, properly lubricated it will certainly get the trains over the road with heavy tonnage, and when you get a good engine crew a good share of the battle is won.

PRESIDENT: We would like to hear from Mr. Eckroate.

MR. W. H. ECKROATE: I have in mind one road that are running the Mallet type engine, and they are using the kind of stokers that Mr. Crawford speaks of. They are running these Mallets over a 160 mile division. They have had ten of those engines that have run for seven months, and in that time they have not had one steam failure or one stoker failure. That is more than I can say for the stoker we have on the Wheeling and Lake Erie. The stoker we have requires a large force of machinists to keep them in repair. They are so designed that if anything goes wrong the fire need not be put out to make the repairs. As to its being a fuel saver I can't see where it saves fuel. We have had stokers go out of commission and the fireman fired it over the same division with full tonnage and made just as good time as that made with the stoker, so as to the stoker increasing the efficiency of that engine as to hauling more

tons, it didn't show any more tonnage because an engine will haul all it can handle; and after the stoker went out of commission he took the scoop and came right along better than the stoker did. So that is about all the difference that I can see.

PRESIDENT: I think this deserves a little rebuttal. I am going to ask Mr. Bartholomew, President of the Locomotive Stoker Company, to back up Mr. Crawford in the question of economy of the stoker or anything else he wants to talk about.

MR. BARTHOLOMEW: Mr. Chairman and Members of The Railway Club of Pittsburgh: It is hardly necessary for me to say anything further on the Stoker subject, as Mr. Crawford has covered it so completely.

Our efforts have been for eight or nine years directed at the development of the art of firing locomotives mechanically rather than the mere development of a stoking machine.

Mr. Crawford, as you know, has been interested in this art even longer than the rest of us, as he perfected and put into use a large number of stokers on Pennsylvania Lines West some years ago before the Locomotive Stoker Company, with which company we are now both connected, was organized.

You have seen illustrated in Mr. Crawford's paper some of the purposes and reasons for the development of the stoker and the results obtained from its use.

It is possibly quite true that the stokers which are on the market today are not the final answer, but somebody in some way or somehow is going to have the answer to all of the stoker problems which confront us, and we have pride in assuming that our Company is going to be that somebody.

Mr. Crawford's paper has been directed along the lines of bringing a full realization of what can be accomplished with stoker-fired power as compared with locomotives manually fired.

Information has been given as to the sizes of locomotives which can be considered as requiring stokers and those which can be manually fired to capacity.

Mr. Crawford has illustrated in tabulations shown that stokers have been consistently applied only to locomotives

having a tractive effort above 50,000 pounds. This would indicate that somewhere at about this point is the logical line to draw between hand-fired and stoker-fired power as far as conditions in this country are concerned.

We recently had friends visiting us from abroad, and we were surprised to discover that their point of view was somewhat different than our own in this respect, so that if we come to apply stokers to locomotives in foreign countries, we may be obliged to take into consideration other controlling factors that are essentially different than those which have determined the hand-firing limits here. It is quite evident that stokers would be of service on smaller power in certain foreign countries than with us.

The application of stokers to practically all locomotives purchased by the United States Railroad Administration, which had a tractive effort of 50,000 pounds or over, established the status of the stoker so permanently that few, if any, locomotives will be bought hereafter without mechanical stokers as definitely in the specifications as other details with which we are familiar, such as injectors, superheaters, brick arches, etc.

PRESIDENT: I was just wondering when Mr. Bartholomew was speaking where the stoker would be without superheat or where superheat would be without the stoker. I notice Mr. Gilbert E. Rider here of the Superheater Company. Perhaps he would like to tell us something about it.

MR. G. E. RYDER: Mr. President and Members of the Pittsburgh Railway Club: I greatly appreciate having had the opportunity to listen to Mr. Crawford's very interesting paper on the subject of Locomotive Stokers, as well as the discussion which has followed.

The meeting has been a source of education to me as I have not familiarized myself with many of the details attending the application and operation of locomotive stokers.

As to the factors influencing the selection of locomotives to be equipped with stokers, my impression is that fundamental principles should govern. If the return following the application of stokers to a class of locomotives justifies the

cost, the decision is made automatically. This fact applies whether the device under consideration is stokers or any other device, and it remains to be said that when investment in any device is justified by the return to be realized, the device must be paid for whether the investment is made or not, and it is paid for at a higher price if it is not purchased.

Just a word in connection with the limitation of locomotive stokers. I cannot conceive of an objection to the application of a mechanical stoker to a locomotive as large as the "Big Virginian," with which we are all familiar. As opposed, I do not believe that it would prove economical to operate a stoker on a small American type locomotive which has been reduced to branch line service on account of its size. Somewhere between these extremes there must be a limiting line, influenced to some extent by governing conditions. In some instances it may be more economical to stokerize a 40,000 pound tractive power locomotive and in others to hand-fire a somewhat higher tractive power engine. As I see it, the line of limitation is not clearly drawn and within the zone of variation one railroad cannot set its policy by that of another.

One point more in connection with the terms in which the saving from locomotive devices is discussed: We have become accustomed to think almost entirely of economy in fuel saving, while the stoker saving is probably better described in transportation units on a basis of time. Thank you.

PRESIDENT: It is raining too hard to go home. I think you better make use of the time to keep this discussion going.

MR. ANDERSON: In the absence of somebody else to speak I wish to express the interest that I have enjoyed in listening to this, as it may be called, University paper, because it is not only exact in detail, but it covers from the beginning to the present. Some years ago James A. Gaily devised a plan of heating air in advance of putting it into the blast furnace and saved, as I recall it, some twenty per cent in the economy of operation; and this question occurred as to whether in this development of the stoker

there was any inquiry or any study given to the question of raising temperature of the coal before it went into the furnace of the locomotive, to any question of saving that amount of heat, how much heat it required and how much lost thereafter, which would come about by requiring the coal to be heated from the state it was in, the temperature it was in, in the fire-box to the temperature needed to ignite from the tender temperature to that needed to ignite it in the fire-box. Then following that was the question whether this latest stoker by using more coal, increased or gained anything in the way of thermal units, and therefore gained some economy in that manner. Because if you put more coal in the fire-box, it takes longer to heat and therefore delays the ignition and should cause loss, and that is probably the reason for the falling down of the results from the use of the coal. But the whole matter, Mr. President, leads to this thing which I have had in mind to say to this Club for several meetings, and since you have become President, upon your return from across the water, it may be more appropriate now than it would have been heretofore; and that is the wonder grows upon me every day that with this big power we have, as shown on the screen, and when we realize that that immense tonnage comes from operation of about thirty ounces of grey matter, it is a most astonishing proposition, and then also the fact that there is required from the railroad man and operator alike more real thought than imposed upon any other line of business in existence, and therefore, it was with great interest I followed all these details that Mr. Crawford has worked out in this paper. While the railroad business is the most public business we have in the country, in the world over, touches more people, and there are very few people but what ride on railroad trains or see a railroad train or hear the whistle or bell every day of their lives, and yet as a paradox, there is not a subject upon which among the public in general there is such an absolute ignorance of what is required to provide a train at a terminal station upon which you can pick up your bag on a moment's notice and walk up and be transported any place over the country. That was more apparent during the crisis of the war, and therefore as a man who had been

some years ago in the active service, I realize very fully the problems you gentlemen were up against, and I have had in mind during this last year to put upon the records of this Club some appreciation from one who knew what the problems were that had to be met. Therefore, through our present President, I feel it is not assuming too much that in behalf of the public that I would pin upon the railroad man, not only of this Club but through this Club every railroad man in the country, a Distinguished Service Cross for faithful performance in the lines behind the guns in support of the President and those who were with him, who went across the waters and so successfully in all those details carried out and settled forever the question between autocracy and democratic government. Because we must remember, and it is now well known history, that if Germany had won this war they would have dominated this country, and a gathering such as we have here tonight, would have been impossible, because we would not have been allowed to gather together in a meeting like this without an inspector or spy hearing every word and reporting every word to the Government officers of what took place, and we could not have any discussion pro and con on a subject like this if it did not suit the government officers, because it was their plan to prevent any change in their government, to prevent any gathering of any particular mention. Therefore, Mr. President, I would do this act of putting upon the record an appreciation on the part of the public for the great service that was rendered by the railroad men of the country during these crisis of the war.

PRESIDENT: I think I possibly should pass that along to you gentlemen and just add to it that we, who were privileged to go across during the war, most deeply appreciate the work which was done by the railroad men and the manufacturing industries in supplying the tools, machinery, supplies and equipment to us who were in France. It would have been a physical impossibility to have done anything in France with the equipment or material or supplies which were obtainable in France or on the Continent or in England. There was nothing there in excess of what was absolutely essential to meet the needs of the

French, English and Belgium armies, so that we were entirely dependent upon you men in this country to provide us the where-with-all to do ur work; and I think one of the out-standing accomplishments of the war was the magnificent response which was made to the demands for material, men and supplies, which were essential to the successful operation of the armies in France, by the railroad men and the manufacturing industries of this country. Unless you were there you cannot realize the utter denuding of those countries of materials, supplies, etc. and not only were we absolutely dependent, but our Allies were also to a very great extent, upon this country, and our going over there would have been simply a farce if you men had not in turn made the magnificent performances you did in supplying us with the where-with-all to do our work.

It would not seem like a meeting of the Railway Club if our friend, Mr. Stucki, did not say something.

MR. A. STUCKI: Before I start to talk on the subject of this evening, I want to say a word or two about our popular Vice President of two years ago. We missed him very much while he was in France but he made a good job over there. I happened to meet him on his return the very day he was appointed Shop Manager and he already made a success of it, hence, is there any reason why we shouldn't look for a great success from the Railway Club of Pittsburgh?

Coming back to the question of stokers, you all will realize that I have no specific detail experience, but it looks to me that common sense would point towards a mechanical means for doing that work, regardless from what angle we look at it.

In the primitive ages we did everything by hand, but as we progressed, we learned how to do things by machinery. For instance, a carpet or a vacuum sweeper does the work very much better and very much easier than the broom. Again take the foundry—many years ago everything was moulded by hand, now every job requiring accuracy and large output is done by machinery.

Why should we then suddenly stop and not try to move

the coal cheaper, easier and more uniformly, if it can be done by machinery.

Mr. Bartholomew is right when he says that we cannot look for an ideal machine to begin with—it has to be developed and I repeat with him that sometime, somewhere, someone will have a fully developed machine. I enjoyed the paper especially because Mr. Crawford dealt with broad underlying principles, leaving the constructive details for further consideration.

MR. KELLY: I would like to ask the speaker of the evening one question, and that is during the several tests he has made whether he was able to run as much nozzle with stoker-fired as with the hand-fired.

MR. CRAWFORD: Gentlemen, I cannot add to what I have said, not that I haven't any more to say, but, forty minutes of stokers in one evening is a good deal. In answer to the questions. First, Pre-heating the coal it is different with the locomotive than with the blast furnace. I stated it very clearly, I think, and I think we will all begin to realize after a while that a pound of coal has no more heat units in it, it won't combine with the oxygen or air in any different manner whether put into the fire-box by hand, shovel or whether projected in by steam jets or accidentally falls in. As I said in my paper you cannot get something for nothing. That is what I meant. There is no method by which the heat units in a given pound of coal can be increased, therefore the difference between a boiler stoker-fired and hand-fired is entirely outside of the method of firing.

As to the question regarding exhaust nozzles, I put that in a little different words. In the majority of the cases reported to me it has been possible to increase the exhaust nozzle slightly. In some cases it was necessary to reduce the diameter of the nozzle. I think perhaps the most important things we got to give consideration in making tests to determine the efficiency of stoker as compared with the hand-fired is to obtain like conditions. On one test with which I am familiar the locomotive in one case was using 15 pounds water per horsepower and the other was using 35 pounds per horsepower hour, of course it took more coal,

to evaporate, with the forty-five than with the thirty-five pounds, therefore the stoker was reported as using more coal. It did,⁴ and so did the engine. Many tests come to me regarding to the economy of the hand-firing that are clearly on the face of them based on inaccurate information.

I will be very glad to answer any questions that I can, Mr. Chairman, otherwise I have nothing further to add.

MR. KELLY: The reason I asked this question, the road I am employed with, ran a test about six months ago on a stoker engine. First we hand-fired the engine and increased the nozzle to $6\frac{5}{8}$, 7×32 , then we tried to run the same sized nozzle with a stoker, which did not happen to be the Duplex stoker, I am sorry to say, but the stoker on the first trip we tried to run failed for steam. We had to reduce the nozzle back to $6\frac{1}{4}$ before the stoker would maintain the required steam pressure as that the hand-fired, and kept required steam pressure with $6\frac{5}{8}$ th nozzle.

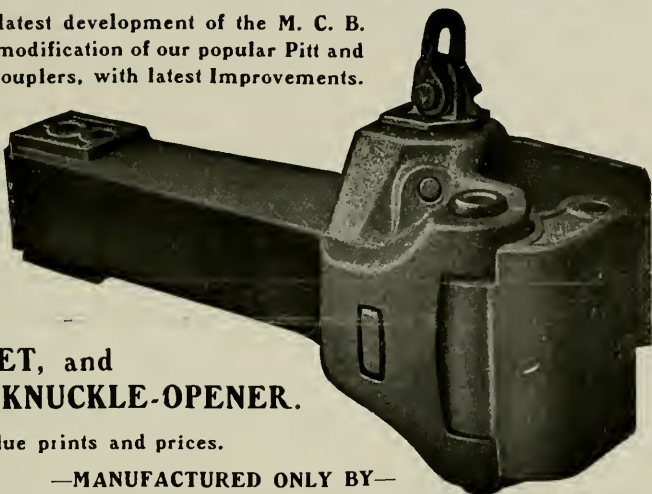
There being no other business the meeting adjourned.

J. D. CONWAY, Secretary.

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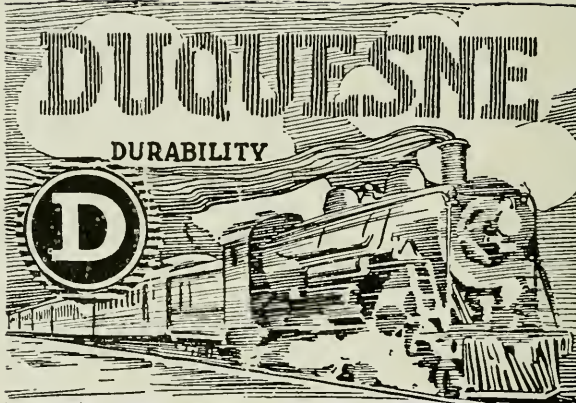
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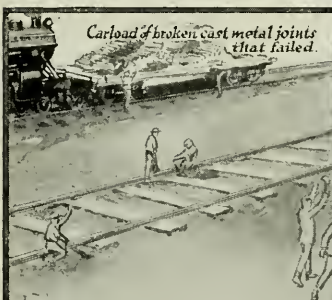
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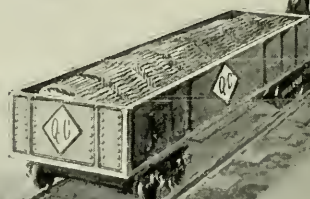
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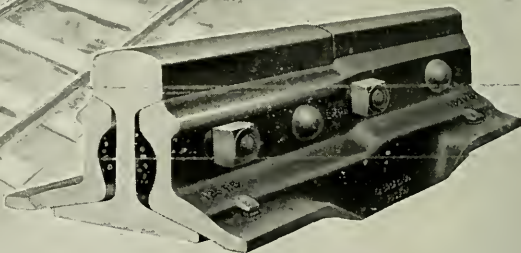
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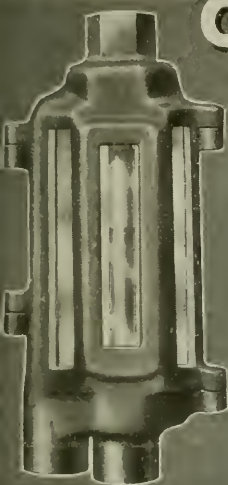
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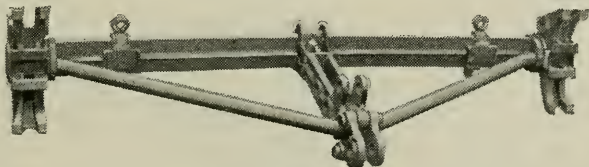
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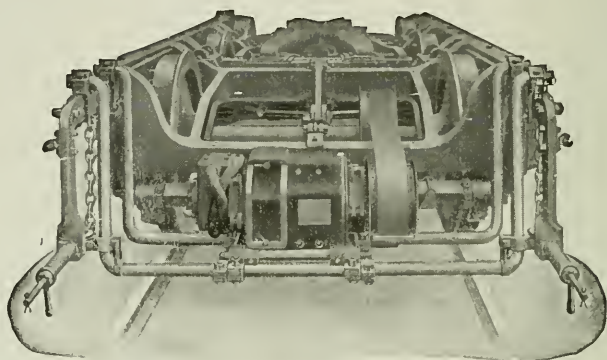
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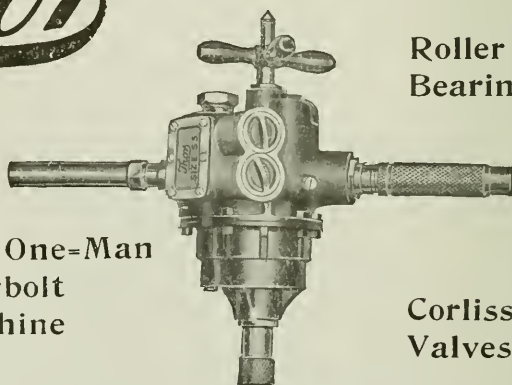
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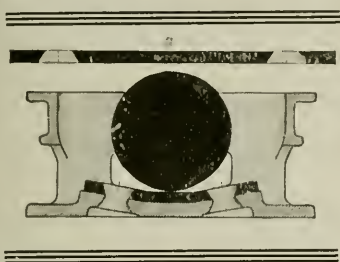
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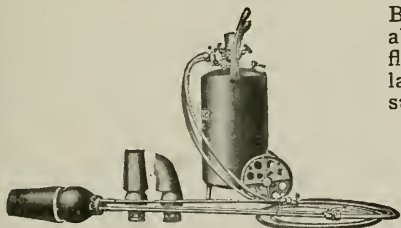
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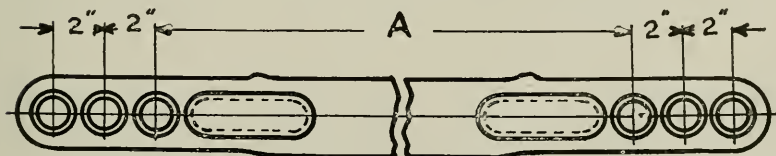
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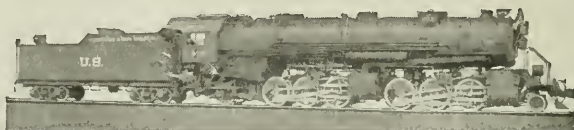
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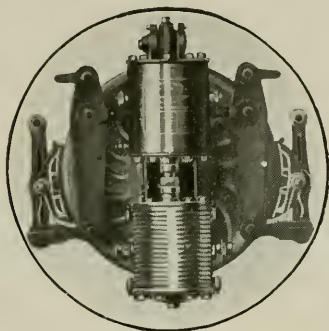
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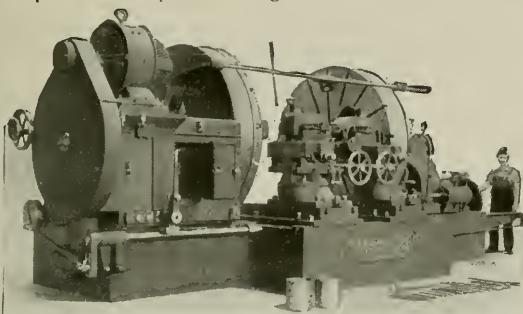
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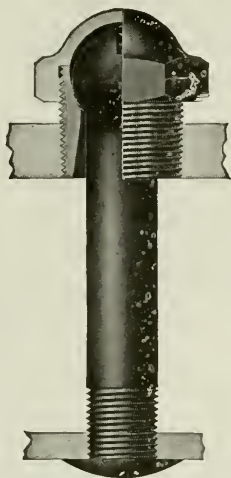
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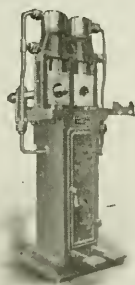
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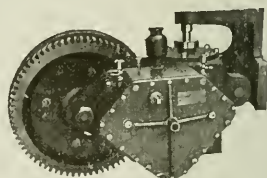


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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs, during the month of December, 1919, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"The Industrial Conflict" by Mr. William L. Cheney of the Survey.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Cummins Bill for the Readjustment of the Railroad Problem" by Hon. Xenophon P. Witley, ex United States Senator from Missouri.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Not received.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"Pictures—The House that Jack Built and First Aid to the Injured" by E. E. Stevens, Safety Engineer, Canadian National Railways.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—Not received.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—Not received.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"How Pneumatic Tools are made, their treatment in service and how to obtain maximum efficiency in their work" by H. S. Covey, Secretary, Cleveland Pneumatic Tool Co., Cleveland, Ohio.

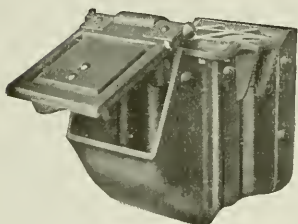
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No. 2

Pittsburgh, Pa., Dec. 18, 1919

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E. C. SATTLEY, General Manager, Page Steel & Wire Co., Pittsburgh, Pa.
CHAS. A. LINDSTROM, Asst. to President, Pressed Steel Car Co., Pittsburgh, Pa.
E. J. SEARLES, Schaefer Equipment Co., Pittsburgh, Pa.
GEO. W. WILDIN, General Manager, Westinghouse Air Brake Co., Pittsburgh, Pa.
J. F. TOWNSEND, Traffic Manager, National Tube Co., Pittsburgh, Pa.

Membership Committee

A. STUCKI, Engineer, Pittsburgh, Pa.
C. O. DAMBACH, General Manager, Unity Railways, Pittsburgh, Pa.
H. E. CHILCOAT, Manager, Clark Car Co., Pittsburgh, Pa.
J. A. KALSTON, Mechanical Engineer, Union R. R. Co., Pittsburgh, Pa.
M. R. REED, M. M., Pennsylvania Lines West, Pittsburgh, Pa.
J. L. CUNNINGHAM, Supt. Motive Power, P. R. R. Co., Pittsburgh, Pa.
W. C. BUREL, M. M., B. & O. R. R. Co., Pittsburgh, Pa.

Entertainment Committee

D. H. AMSBURY, District Manager, Dearborn Chemical Co., Pittsburgh, Pa.
HARRY MURDOCH, President, H. Murdoch Co., Pittsburgh, Pa.
HENRY F. GILG, Representative, Penn Iron & Steel Co., N. S., Pittsburgh, Pa.

Reception Committee

E. EMERY, Manager, Robert H. Blackall, Pittsburgh, Pa.
F. H. FRESHWATER, Chief Draftsman, Pressed Steel Car Co., McKees Rocks, Pa.
J. L. SMITH, General Foreman, P. & L. E. R. R. Co., Youngstown, Ohio.
H. F. GREWE, M. M., P. & W. Va. Railway, Carnegie, Pa.
H. M. WOLF, R. F. of E. P. & L. E. R. R. Co., Youngstown, Ohio.
S. E. VAN VRANKEN, Pur. Agt., Locomotive Stoker Co., N. S., Pittsburgh, Pa.

Subject Committee

JOHN F. LENT, President, Lent Traffic Co., Pittsburgh, Pa.
CHAS. ORCHARD, Traffic Department, Carnegie Steel Co., Pittsburgh, Pa.
JOHN B. WRIGHT, Asst. S. E. Mgr., Westinghouse Air Brake Co., Pgh., Pa.
D. F. CRAWFORD, V. P. & Gen'l Mgr., Locomotive Stoker Co., N. S., Pgh., Pa.
E. B. DeVILBISS, Asst. Engr. M. P., Pennsylvania Lines West, Pittsburgh, Pa.

Past Presidents

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATHERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.
J. G. CODE	November, 1916, to October, 1917.
D. M. HOWE	November, 1917, to November, 1918.
J. A. SPIELMANN	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING, DECEMBER 18, 1919.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock, P. M., President H. H. Maxfield in the chair.

The following gentlemen registered:

MEMBERS

Anderson, A. E.	Lobez, P. L.
Berg, K.	Long, H. P.
Bloom, Edw. B.	Lynn, Samuel
Brand, H. B.	Maisch, Geo. J.
Christy, F. X.	Manning, R. E.
Code, J. G.	Matchett, H. K.
Conway, J. D.	Maxfield, H. H.
Covey, H. S.	Moyer, Oscar G. A.
Crookston, W. G.	McConnell, C. H.
Cunningham, H. R.	McGrann, E. Roy
Dambach, C. O.	McNulty, F. M.
Downs, J. J.	O'Connor, M.
Durant, Chas. H.	Painter, Joseph
Gaw, F. W.	Peirce, E. C.
Gellinger, C. W.	Proven, John
Gilg, Henry F.	Ralston, J. A.
Hale, Chas. E.	Rebstock, J. B.
Howe, D. M.	Redding, D. J.
Johnson, A. B.	Rowley, Charles E.
Kelley, H. D.	Seibert, Wm. L.
Kinch, L. E.	Spielmann, J. A.
King, J. W., Jr.	Stark, F. H.
Krepps, T. S.	Strome, H. H.
Lent, John F.	Winell, K. O.

VISITORS

Allen, J. L.	Gilson, George I.
Anderson, James W.	Gwinner, Oscar P.
Barger, G. W.	Hoag, A. R.
Buckley, Dan, Jr.	Keller, W. H.
Carlsson, John	McCully, H. H.
Carrier, B. R.	Newman, H. S.
Cooley, G. B.	Nicholas, A. D.
Cunningham, H. L.	Schmitt, Francis
Garber, W. R.	Shepler, W. H.
Wadsmith, P. L.	

The call of the roll was dispensed with, the record of attendance being had on the registration cards.

The reading of the minutes was by common consent dispensed with, as the Official Proceedings are now in process of printing.

The Secretary read the following applications for membership:

Allerton, Harold N., Clerk, Union R. R., 125 Blackhawk Street, Pittsburgh, Pa. Recommended by A. F. Coulter.

Benson, Wm. W., Publisher, Railway Review and Outlook, Wabash Building, Pittsburgh, Pa. Recommended by J. Fred Townsend.

Boyle, Bryan W., Yard Clerk, Union R. R., 135 West 9th Avenue, Homestead, Pa. Recommended by R. S. Wilson.

Chaffin, H. B., Assistant Master Mechanic, Pennsylvania Lines West, Canton, Ohio. Recommended by M. R. Reed.

Coleman, Jacob C., Clerk, Union R. R., 918 Cliff Street, Brad-dock, Pa. Recommended by R. S. Wilson.

Corbett, Edward W., Clerk, Union R. R., 313 Center Street, East Pittsburgh, Pa. Recommended by A. F. Coulter.

Davis, Karl N., M. P. Inspector, P. R. R., Room 203, Penn-sylvania Station, Pittsburgh, Pa. Recommended by H. G. Huber.

Elliott, J. S., Gang Foreman, P. R. R. Co., Middle St., West Brownsville, Pa. Recommended by C. B. Gray.

Farnsworth, James Neville, Clerk, Union R. R., R. F. D. No. 1, Main Street, Homestead Park, Pa. Recommended by R. S. Wilson.

Feathers, M. F., Tel. Operator, Union R. R., 533½ Second Avenue, Pittsburgh, Pa. Recommended by R. S. Wilson.

Fedele, Joseph M., Interlocking Switch Repairman, Union R. R., 1111 Roland Street, Wilkinsburg, Pa. Recommended by R. S. Wilson.

- Gill, Wm. A., Clerk, Union R. R., East Pittsburgh, Pa. Recommended by R. S. Wilson.
- Greenaway, Roy W., Clerk, Union R. R., 1216 Glenn Avenue, Wilkinsburg, Pa. Recommended by W. C. Bradley.
- Hambrock, O. F., Mech. Inspector, Pennsylvania Lines West, 703 Chamber of Commerce Building, Pittsburgh, Pa. Recommended by C. R. Branson.
- Hunter, David C., Clerk, Union R. R., Parkview Avenue, Lincoln Place, Pa. Recommended by A. F. Coulter.
- Jack, R. Ralph, Clerk, Union R. R., Willock, Pa. Recommended by W. C. Bradley.
- Kane, Jno. J., Gang Leader, Union R. R., 313 Hawkins Avenue, Braddock, Pa. Recommended by R. S. Wilson.
- Keller, W. H., President, Keller Pneumatic Tool Co., Grand Haven, Mich. Recommended by J. D. Conway.
- Kohute, Hilary Geo., Clerk, Union R. R., East Pittsburgh, Pa. Recommended by A. F. Coulter.
- Lambert, Wm. D., Chief Clerk, National Tube Co., 1922 Frick Building, Pittsburgh, Pa. Recommended by J. Fred Townsend.
- Layman, F. A., Editor, Railway Review and Outlook, Washash Building, Pittsburgh, Pa. Recommended by J. Fred Townsend.
- Lowstetter, S. H., Yard Master, Union R. R., Box 13, Wilkinsburg, Pa. Recommended by R. S. Wilson.
- Martin, Albert H., Gang Foreman, Penna. R. R., 1100 Murtland Avenue, Pittsburgh, Pa. Recommended by C. B. Gray.
- Miles, H. E., Clerk, Union R. R., 5467 Broad Street, Pittsburgh, Pa. Recommended by R. S. Wilson.
- Mullen, M., A. R. A. Billing Clerk, Union R. R., East Pittsburgh, Pa. Recommended by A. F. Coulter.
- McGovern, John C., Clerk, Union R. R., 7960 Tioga Street, Wilkinsburg, Pa. Recommended by R. S. Wilson.

- McMullen, Alex, Conductor, Union R. R., 914 North Avenue, Braddock, Pa. Recommended by R. S. Wilson.
- McMunn, J., Yard Master, Union R. R., 112 Fifth Street, Braddock, Pa. Recommended by R. S. Wilson.
- Niland, John J., Gang Foreman, P. R. R. Co., West Brownsville, Pa. Recommended by C. B. Gray.
- Oskin, Raymond Z., Yard Clerk, Union R. R., 711 Braddock Avenue, Braddock, Pa. Recommended by R. S. Wilson.
- Proft, J. W., Clerk, Union R. R., 5734 Melvin Street, E. E., Pittsburgh, Pa. Recommended by R. S. Wilson.
- Rauch, T. T., Gang Foreman, Pennsylvania R. R., 506 Brownsville Road, Mt. Oliver Station, Pittsburgh, Pa. Recommended by C. B. Gray.
- Reed, C. R., Special Agent, Union R. R., 609 Center Street, Wilkesburg, Pa. Recommended by R. S. Wilson.
- Reinhardt, A. L., Gang Foreman, P. R. R., Elrama, Pa. Recommended by C. B. Gray.
- Richard, George A., Clerk, Union R. R., 108 Seventh Street, Turtle Creek, Pa. Recommended by R. S. Wilson.
- Richard, H. S., Yard Clerk, Union R. R., 108 Seventh Street, Turtle Creek, Pa. Recommended by R. S. Wilson.
- Sharbaugh, Oliver M., Clerk, Union R. R., 10 Johnston Street, Wilkesburg, Pa. Recommended by R. S. Wilson.
- Shew, Grover C., Foreman Car Repairs, P. R. R., West Brownsville, Pa. Recommended by C. B. Gray.
- Shuster, E. H., Yard Master, Union R. R., 608 Arlington Avenue, McKeesport, Pa. Recommended by R. S. Wilson.
- Snowwhite, Thomas H., Surgeon, Union R. R., East Pittsburgh, Pa. Recommended by W. C. Bradley.
- Speidel, Wm. C., Yard Clerk, Union R. R., 811 McClure Street, Homestead, Pa. Recommended by R. S. Wilson.

Stevens, L. V., Secretary and Treasurer, Locomotive Stoker Co., Robinson and Darrah Streets, N. S., Pittsburgh, Pa. Recommended by J. D. Conway.

Titus, T., Assistant Engineer, M. P., Penna. R. R., Western Lines, 703 Chamber of Commerce, Pittsburgh, Pa. Recommended by C. R. Branson.

Wheeler, William H., Gang Foreman, Penna. R. R., West Brownsville, Pa. Recommended by C. B. Gray.

Willey, John A., C. C., P. R. R., West Elizabeth, Pa. Recommended by C. B. Gray.

Williams, W. W., Stockman, P. R. R., Courtney, Pa. Recommended by C. B. Gray.

Wilt, C. H., Mech. Inspector, P. R. R., Western Lines, 703 Chamber of Commerce Building, Pittsburgh, Pa. Recommended by C. R. Branson.

PRESIDENT: When these applications have been approved the gentlemen will become members without further action than the payment of one years dues.

The Secretary read the proposed Amendments to the Constitution and By-Laws which had been properly presented at the previous meeting and are now presented for final consideration. The proposed Amendments are as follows:

Proposed Amendments to Constitution and By-Laws, presented at meeting of December 18, 1919, as follows:

CONSTITUTION

Article III.

Section 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

BY-LAWS

Article III.

Section 1. The annual dues of members shall be Two

Dollars, payable in advance on or before the fourth Thursday of September each year.

Section 2.^a The annual subscription to the printed Proceedings of the Club shall be at the published price of One Dollar. Each member of the Club shall pay for both dues and subscription. Dues and subscription paid by members proposed at the meetings in September or October shall be credited for the following fiscal year.

Section 3. At the annual meeting members whose dues and subscription are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

Upon motion duly seconded the Amendments above proposed were unanimously adopted.

There being no further business, the speaker of the evening Mr. H. S. Covey, Secretary of the Cleveland Pneumatic Tool Company, was introduced by the Chair and presented his paper as follows:

HOW PNEUMATIC TOOLS ARE MADE, THEIR TREATMENT IN SERVICE AND HOW TO OBTAIN MAXIMUM EFFICIENCY IN THEIR WORK.

By H. S. COVEY,

Secretary, Cleveland Pneumatic Tool Co., Cleveland, Ohio.

Mr. President and Gentlemen of the Railway Club of Pittsburgh: We appreciate the privilege granted us through the cordial invitation of the Officers of this Club to contribute an article on "How Pneumatic Tools Are Made, Their Treatment in Service and How to Obtain Maximum Efficiency in Their Work."

We shall display here tonight Motion Pictures showing a Modern Pneumatic Tool Factory and Forge Plant in operation, showing how Air Tools are built, beginning with the rough stock and follow them through each stage of manufacture to the final assembly.

It is our desire to create a personal interest in Pneumatic Tools by showing how carefully they are made, which we

hope may eventually improve the conditions surrounding their care and use.

Before we proceed with the Motion Pictures we have a few words to say regarding the early history of Pneumatic Tools and their close association with railroad work. The manufacturers of Air Tools owe a lasting debt of gratitude to the railroad men of the past two decades for their generous assistance during their early struggles for recognition and for the opportunity afforded them of using the Railroad Shop for their experimental work. It may be justly stated that the Railroad Shop was the cradle of the Pneumatic Tool Industry and the foundation of their success.

The first model of the Air Tool was the Reciprocating type of machine such as the Riveting and Chipping Hammer in which the plunger was thrown back and forth in the Hammer Cylinder by compressed air, the action of the plunger being controlled by an Air Operated Valve enclosed in a valve cage at the rear end of the Hammer Cylinder. The first tools were, of course, crude in their construction, very heavy to handle and hard to hold on the work as no way at that time had been discovered to cushion the blow of the plunger on its return stroke, and it hit about as hard in one direction as in the other. Operators complained about the "kick" and the excessive vibration, and some trouble was had to induce the men to use them at all. Notwithstanding these discouraging features the inventors did not lose faith in the ultimate success of the Air Hammer, but steadily pushed on, making changes here and there which eventually overcame the trouble.

Following closely on the heels of the Riveting and Chipping Hammer came the Air Motor, likewise crude and heavy at the start. Several different types were tried out and finally the Four-Piston Motor was found best for general work and was adopted as the standard type of Air Motor. As time progressed, so also did improvements of Air Tools, and the manufacture of them in large quantities began in earnest. Capital was attracted to this new industry and companies were formed and factories built for their production on a large scale.

It is not our intention to write an extended history of

Pneumatic Tools, or follow them through every change of design which has occurred in the past 25 years, but merely to touch the high spots, giving a glimpse of the beginning of the industry as compared to present day construction.

Air Tools have now reached such a degree of perfection in design, workmanship and operation, that it seems impossible to further improve them.

Every type of Pneumatic Tool now made is used in some capacity in Railroad Service, for which they were originally designed. Other steel industries finally adopted the Air Tool, but only after Railroad Companies had been using them successfully for several years. It, therefore, may be said without fear of contradiction, that the great success enjoyed by the respective Pneumatic Tool Companies came about through the generous support and permanent patronage of the Railroad Companies.

Pneumatic Tools have revolutionized the world's work in the fabrication of steel, in the mining of coal, gold and silver, in the quarrying of rock and in monumental work. They built the battle fleets of the world and every steel ship afloat. The Air Gun is the "Peace Gun" of the future, and will help rebuild the countries destroyed by the ravages of war.

For the benefit of absent members of this Club tonight who will doubtless read this article in the "Proceedings" we will here give a brief description of the Motion Pictures as they appeared on the screen, showing the first series of pictures beginning with the Forging Department:

A view of the steel yard in which thousands of tons of high and low carbon Chrome Nickel and Vanadium Alloy Steels are stored.

The unloading of steel by electric magnet and the transporting of same from cars to yard and to machines.

The laboratory in which the different grades of steel are analyzed to check the mill analysis.

The handling and planing of Die Blocks as they are prepared for design.

How the design is traced on the Die Block and the pattern prick-punched as per template made from blue print.

Battery of Die-Sinking machines cutting the design in the Die Block.

The Cherry Machine which roughs out the design nearly to desired shape, a very interesting machine, nearly human in its intelligent action.

The scraping and finishing of the die, which is done by hand.

How a lead cast is made to check the finished die.

Large "shear" which cuts 4½-inch square steel bars cold.

Heating furnace in which steel billets are heated ready for the drop hammers.

Drop Hammer in operation forging hot metal in the die.

Trimming Press in which the "flash" is removed.

Forging and trimming of Pneumatic Tool Handles.

Heat treating of Handles of Air Hammers—they are first heated uniformly to the desired degree of heat, depending upon the carbon ratio, then are cooled in oil, again reheated for temperment in the drawing furnace and air cooled. The Handle Forgings after heat treatment are carefully polished and sand-blasted which gives them a velvet-like finish.

Machines turning Hammer Cylinders from bar stock, the cutting tools have tubes through which the cutting compound is fed to the cutting edge of tools—the bar holder used in reaming the cylinder bore has inner bearings through which the reamer operates, insuring perfect alignment and uniformity of the holes.

Forty Drill Presses kept busy boring long port holes in Hammer Cylinders, each cylinder has six long holes, varying in length from 3 to 12 inches in depth and ⅛ to 7-32 inches in diameter.

The Internal Drilling Tool is ingeniously designed to operate within the bore of the Hammer Cylinder and drills holes at right angles to meet the down holes in the wall of cylinder. The old practice of drilling from the outside of cylinder and plugging holes is now obsolete.

Tempering Room—In this room all tempering of steel parts is done, it is provided with every device for the proper hardening of the different parts of the Air Hammer and Air Motor. Some parts require different treatment than do others, based on the service and strain to which they are

subjected. Some parts are made of mild steel and are given surface hardening only, which is better than hardening throughout, delicate pieces are heated in lead.

Inspection Room—Every necessary implement for measuring, gauging and testing for hardness is employed here, a triple checking system is used to detect individual errors. Careful inspection is exercised at every stage of manufacture, and all parts rigidly tested for extreme service so that any weakness which may have escaped surface inspection may be detected before final assembly.

Both external and internal Grinders are used in finishing hardened parts, such as Plungers, Valves, Valve Blocks, Cylinders of Chippers and Riveters, Motor Valves and Pistons, Cranks and other hardened parts of Air Tools.

Accurate jigs and templates are provided for each kind of part to insure extreme accuracy in their production.

The finest machinery obtainable is used in the production of Air Tools, each machine is selected and properly tooled for the class of work upon which it is to be used.

The Assembling Room—The assembling of Air Hammers, Air Motors and other tools require men of a high order of intelligence. The general knowledge they acquire in this Department fit them for Saleswork to which they are promoted as occasion requires.

Testing and Recording Machines—The machines shown were designed and built in our own factory, they record accurately the number and foot pounds of each blow and the air consumption per minute of the reciprocating type of tool such as Riveting and Chipping Hammers, Sand Rammers and Rock Drills, also the revolution per minute, horsepower and breakload in pounds of Piston Air Motors. All machines are carefully tested on these machines and must show the proper power and speed before passing inspection.

We have only given a bare outline of the work shown in the Motion Pictures, sufficient, however, to convince the reader that the most painstaking care is exercised in the making and finishing of each individual part entering into the complete tool, thus insuring perfect interchangeability of all parts when required for replacements.

CARE AND USE OF PNEUMATIC TOOLS.

Compressed Air is the most useful power generated, unlike steam it can be piped long distances without much loss in transmission if larger pipes are used.

Builders of Air Compressors have given us some very reliable data on the transmission of air and loss in pressure sustained through friction. They claim a frictional loss of 18 pounds is sustained through a 1-inch pipe in a travel of 1,000 feet, but no appreciable loss in the same distance through a 3-inch pipe.

It is unfortunate when reliable data may be had that users of air should continue to use small pipes in their systems and numerous elbows, all of which are so detrimental to the Air Tool.

Low pressure and wet air put the Pneumatic Hammer entirely out of commission, if it runs at all the blow is feeble and rivets driven under such conditions are not tight and must be cut out as they will not pass inspection.

There are four indispensable things required in the successful operation of the Air Tool, and these are **Dry Air, Volume, Uniform Pressure, and Lubrication.** Dry Air may be had by piping the Receiving Tank in the following manner:

The tank should be large, set in a vertical position and provided with a draincock at the outside near the bottom of tank. The large shop pipe should enter the tank from the outside at a point 12 inches from the bottom. When the air reaches the tank from the compressor it is exceedingly hot and has a pressure of seven to eight atmospheres; being hot it immediately rises to the top of the tank as does each succeeding pulsation. The air being tapped in the tank it must remain there until sufficiently cooled. As condensation starts at once the water falls to the bottom of the tank. As the air cools and drains it moves downward until it finally reaches the mouth of the shop pipe and moves on its journey to the Air Tool in good working condition.

Volume and Pressure—To maintain adequate volume and uniform pressure the shop mains should be large as they are the trunk lines which carry the air to the most distant point

of the system, they should have a gradual rise until when they reach the most distant point they are considerably higher than the receiving tank. All branch lines which cross the path of the main trunk line, from which they draw their supply, should always pass above and take their air from the top of the main pipe. If there is any water still in the mains it is at the bottom working its way back to the supply tank.

Compressed Air is saturated with oil from the Compressor and is never quite eliminated at the Receiving Tank where the first Cooling of the Air takes place as previously mentioned. A considerable proportion of the oil, therefore, passes on through the shop mains and branches to the drop pipes at which point the Hose Line is attached, leading directly to the Air Tool.

The Oil has a detrimental effect on the rubber inner tube of the Hose causing it to disintegrate, particles of which become detached and enter the Air Tool where they lodge in the Valves and Air Ports of the Hammer causing serious trouble.

The Manufacturers of Air Tool Hose were forced to find a remedy to correct this trouble, and finally brought out a type of Hose having a Composition Inner Tube which neutralizes the action of the Oil to a certain extent but does not wholly eliminate the trouble.

Inventive minds working on this problem have recently discovered a simple device which we believe to be a solution of the trouble. This is an Oil and Water Separator that may be made in your own shop at a nominal cost. It consists of a 3-foot section of 5-inch Iron Pipe, capped at top and bottom and is attached to the branch Air Pipe Lines which feed the drop Pipes and Hose Lines. The Branch Pipe enters the Separator at the top through one side of the cap and runs down the inner side of the Separator to a point 3 inches from the bottom when the Air is liberated, escaping into the Cylinder and returning to the top of the Cylinder through a series of Baffle Plates which are attached at regular intervals to the Branch Pipe; this filters the Air and the Oil clings to the Baffle Plates.

The Air leaves the Separator at the top, entering the branch outlet pipe attached to the cap at the opposite side

to the inlet. The Air is thus freed from Oil and such Water as may still remain in the system.

The Separator is drained of its accumulated Water and Oil through the drain cock provided at the bottom cap of the Separator. Occasionally the lower cap of the Separator should be removed and the Baffle Plates cleaned by means of a stream of Compressed Air which quickly removes the Oil adhering to them.

Fittings—The selection of proper fittings that will offer least resistance to the passage of the Air are just as important as large pipe lines to aid in the reduction of friction in transmission of the Air from the drop lines through the hose to the Air Tool.

Air Valves which have any ankle turns in the air passage are objectionable because they impede the direct travel of the Air into the hose.

Hose Couplings, like the Valve, should have an unobstructed air passage.

Lubrication: The close fit of all working parts of the Air Tool necessitates frequent lubrication, particularly in the Riveting and Chipping Hammers. The oil used should be of good quality that will not gum, heavy black machine oil should never be used as there are numerous air ports in Valve Blocks and Cylinders that must be kept open. The tendency of the heavy oil is to clog these ports, which impedes the proper circulation of the air.

If the air is charged with water it washes away all lubricant and the hammer loses its efficiency, refuses to work and the delicate parts and polished surfaces become rusted. The hammer should have a bath every night in coal oil, which soaks up the worn out oil of the day and each morning should be attached to the hose and blown out thoroughly, then fresh oiled and put in service. If treated in this fashion it will perform like a new tool.

We do not deem it necessary to dwell further on the care and use of the Air Tool, except to recapitulate and say that if dry air, in sufficient volume at adequate pressure be furnished, plus suitable lubrication, we predict that your Air Tool troubles that infest the day "will fold their tents like the Arabs and gently steal away."

In this connection we might state that we are preparing a "Booklet" on the Transmission of Compressed Air, Reduction of Friction and Moisture, proper Piping for large and small installations, economical use of Air through Manifolds, care and use of Air Tools; in fact, everything of real importance in the economical use of Air from the Compressor to the Air Tool. It will be illuminated with drawings from our Engineering Department. It will be a practical text book on Air installation. It should be in the possession of all users of compressors. The Booklet will be mailed free to any one desiring it.

In conclusion I desire to thank you one and all for your patience and close attention and only hope that I have contributed something of real value and added to your enjoyment this evening.

PRESIDENT: Gentlemen, this most interesting paper is now before you for general discussion. I am going to ask Mr. F. H. Stark, of the P. & L. E. R. R., if he will not kindly start the discussion by telling us something about the air tools thirty or forty years ago, as compared with the present.

MR. F. H. STARK: Mr. Chairman, I did not suppose our new President would take advantage of me by requesting me to open the discussion, for I must confess that I am not qualified to do so. The subject of air tools is of vital importance, and the paper presented by the speaker of the evening, together with the illustrations, has been of more than usual interest. There is one feature about the subject that we are extremely interested in, and that is, maintaining constant adequate pressure. This of course involves plant capacity, dimensions and maintenance of air lines, and separating the condensation and prevention of freezing. Our trouble seems to be lack of air line capacity, and proper separation of condensation, resulting in ice forming in the lines, and consequent damage to the pipe connection. We have with us, our Electrical Engineer, Mr. C. H. McConnell, and our Mechanical Engineer, Mr. Karl Berg, and I trust that they may enlighten us on the subject.

MR. C. H. McCONNELL: Mr. Stark has pretty nearly

put the impossible up to me. I don't believe I can add anything to what has been set forth in the paper.

PRESIDENT: We would be very glad to hear from Mr. Keller, of the Keller Pneumatic Tool Co.

MR. W. H. KELLER: I dropped in here very unexpectedly tonight. I do not desire to add anything to what Mr. Covey has said. He has had more experience than I have. I think if we can get some suggestions regarding the conservation of air—and I was told by Mr. Conway that we might hear something along that line—it will be interesting to us all. I will get more by listening to your troubles than by attempting to tell you of ours. I would like to hear the experience or any kicks that are put up by others.

MR. D. J. REDDING: I have been trying to get some information for quite awhile. Maybe Mr. Covey can help me out on my question of moisture in the air. I want to ask how to prepare an argument to convince the people who have the money to spend that we need more coolers and more tanks and larger pipes and all that sort of thing. On several occasions, I have found it necessary to make complaint about that feature, and almost invariably came back to me with the question—"Will you kindly state to us how much you lose by the presence of this amount of water in the compressed air?" I have never been able to find out and I never have found anybody that can tell me.

Assuming that the compressed air from the point in the piping system where it gets down to atmospheric temperature deposits a certain amount of water in the lines per hour; this water is not removed by reason of insufficient after-cooling equipment and passes out through the pneumatic drills and hammers, and assuming for example that this water amounted to five gallons per hour and was distributed with the air through twenty pneumatic tools, is there any formula to determine what effect that will have in the increased wear of the pneumatic tools, and in the decrease in power which should be furnished by a given air pressure.

MR. COVEY: None that I know of. But I assume that the air compressor people who have got out some very good data on the subject of air transmission, would be able to furnish you with reliable data. No better way has been discovered to correct wet air than to drain it as far as possible in the Receiving Tank before it passes through the shop line. Just how much water you will get in a certain volume of air I would not begin to say. If we obtain any information of value on this we will tabulate it in our little booklet which we hope to bring out soon.

MR. STARK: I would like to ask the speaker whether he has found any decided advantage in installing cylinders connected with tubes which provide larger area for the purpose of cooling off the air, as compared with the ordinary storage form.

MR. COVEY: Any ordinary system that is not over large if the pipe in the Receiving Tank is placed 12-inches from bottom you would get good dry air. If you draw air from the top of the Main Pipe into the feed pipes which supply the drop pipes you are bound to get dry air because the water is beneath the air in the mains just the same as water passes steam in a radiator, it is draining back into the Receiving Tank where it is finally drained away. If the distance is great you can have small auxiliary tanks placed along the system that will still further aid the drainage. An oil and water separator placed in your wall pipes where the air hose is attached will eliminate the oil with which the air is saturated.

PRESIDENT: We would be glad to hear from Mr. Finney, of the Independent Pneumatic Tool Co.

MR. H. F. FINNEY: I have listened with a great deal of interest to the discussion about removing the water from the air. We have recommended putting in a large receiver taking the air in at the bottom and out about one-third the distance from the top. By making a receiver large enough, as we understand it, it permits the expansion of the air and the consequent precipitation of the water. Then take the air out of the bottom and put it in another tank which gives

the same thing over and reduces the water that may go in from the first tank. Then take this line and taper it down to the center of the shop and put in a receiver in the center, and the drain at the bottom to remove the water as it goes out. By doing that we get away from the freezing up of the tools, which is a very serious thing especially in car works, where the work is done outside. We are deeply interested in anything that will remove the water from the air, because we believe that will get away from a lot of trouble such as rusting, etc. That is all I have to say.

PRESIDENT: May we hear from Mr. Berg, mechanical engineer of the P. & L. E. R. R.

MR. KARL BERG: Mr. President and Gentlemen, there are conditions where the air requirements are almost equal to the capacity of the compressor, which happens where air lines are extended without the original pipe lines and compressor being enlarged. In such cases it seems to be a question of cooling the air by some means as it passes through the pipes and not by storage tanks alone and drain the water out at some suitable point. Instead of a receiver or cooling tank, a series of pipe columns might be used, thereby giving the warm air passing through these pipes, a large radiating surface, and getting it in that way down to atmospheric temperature where the water is ready to separate from the air, then passing it through some contraption where the water either strikes a baffle plate or some other obstruction and passes into a trap and is released. I am speaking of a system where the requirements are equal or nearly equal to the capacity.

PRESIDENT: May we hear from Mr. Manning, Pittsburgh Manager of the Company.

MR. R. E. MANNING: My views are expressed in Mr. Covey's lecture. On the pneumatic tool end of it, we have been following it up very closely together, with about the same ideas. I do not think I could express any different opinion. I thank you.

PRESIDENT: Is there any further discussion before we adjourn?

MR. A. E. ANDERSON: If there are no further questions, I have enjoyed this paper very much and it is conclusive proof of the benefit and value of the moving picture as an aid to education. There is no device that we have seen in this short time in these pictures that we could have seen in that large plant with nearly as clear and distinct an impression as we have received here, and we have been saved two days travel to Cleveland and back and can get all the benefit we could have gained by going over there and going through the plant. And the whole explanation has been so illuminating that I consider it in line with what the secretary said about the benefits, that it has been worth a great deal more this evening than what the whole cost of the year's dues and subscription to this Club amounts to. Therefore I move that we tender a vote of thanks by rising to Mr. Covey and Mr. Manning for this splendid entertainment this evening.

The motion prevailed by unanimous vote.

PRESIDENT: Mr. Covey have you anything to say in rebuttal?

MR. COVEY: No, I have talked too much as it is. I was thinking about what the gentleman said regarding his compressor that is too small for the work. If it is too small the answer is not to try an expensive cooling system but install a compressor of sufficient size to furnish the requisite amount of air with proper pressure and volume to operate his tools successfully.

There being no further discussion.

ON MOTION, Adjourned at 10:30.

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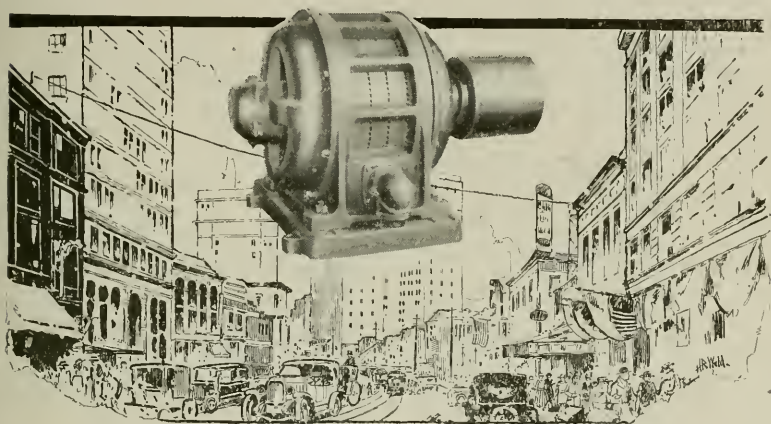
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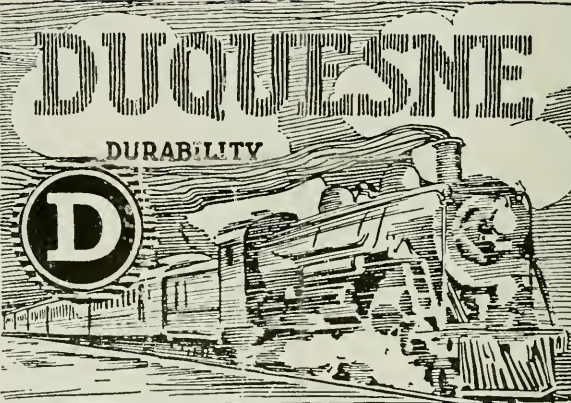
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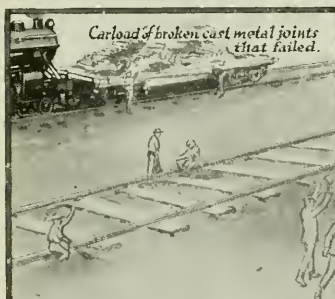
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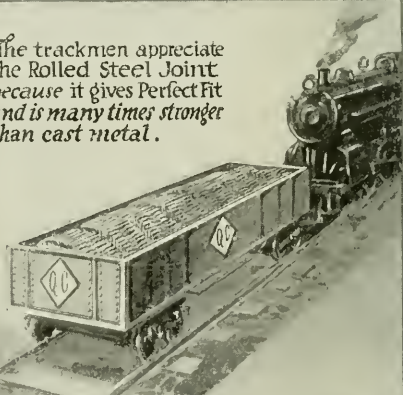
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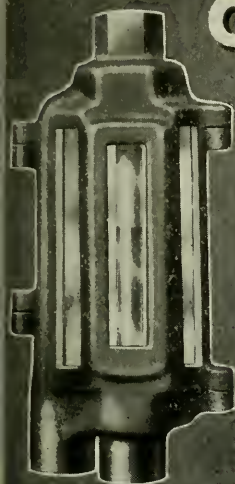
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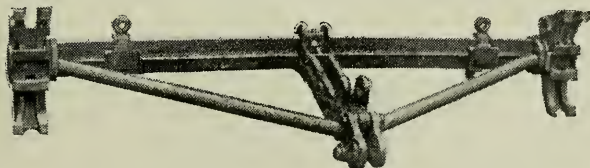
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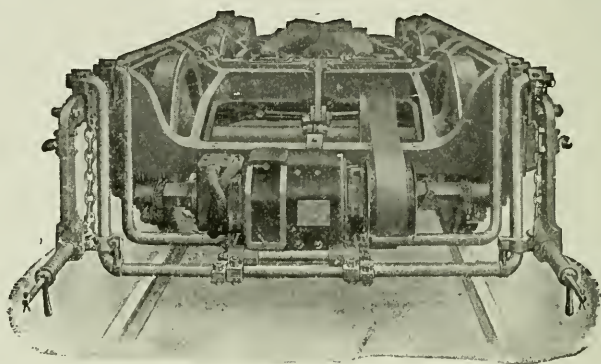
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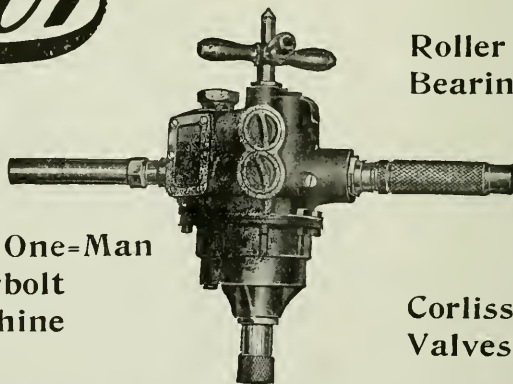
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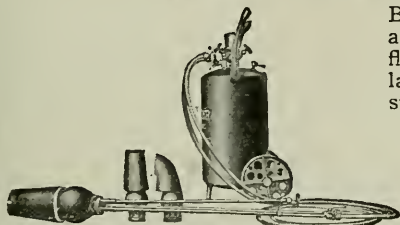
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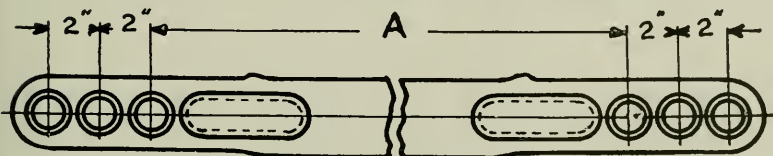
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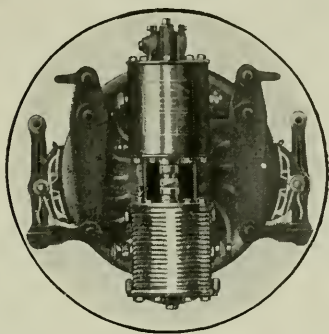
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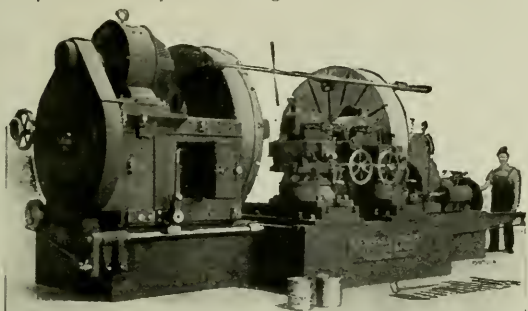
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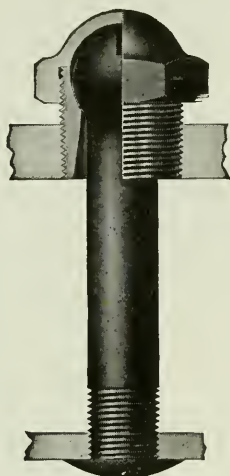
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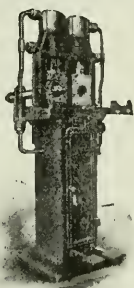
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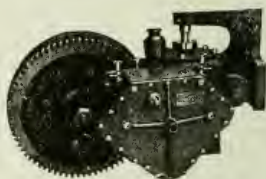


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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of January, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Annual Dinner.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Idealism in Business," by Rev. Z. B. T. Phillips,
Rector, St. Peter's Episcopal Church, St. Louis, Mo.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—"Handling Heavy Tonnage Trains" by Robert Burgess
of the Westinghouse Air-Brake Company.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Annual Meeting and Installation of Officers.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"Graphic Production Control" by E. T. Spidy, Production
Engineer, Angus Shops, C. P. R.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"Store Train Operation" by A. S. McKelligon, General
Storekeeper, Southern Pacific Company.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—"Preparation of the Locomotive at Engine-Houses and
Shops and Its Relation to Fuel Economies" by Leslie
R. Pyle, Supervisor, Fuel Conservation Section, Division
of Operation, U. S. Railroad Administration.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"The Express Service and Present Day Relations with
the Railroad" by D. W. Gibson, Supt., American Rail-
way Express Co.

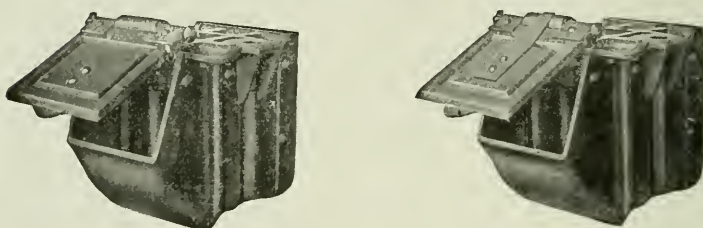
Copies of the above papers can be had upon application to the Secretary at the address given for a nominal price.

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OFFICIAL PROCEEDINGS OF The Railway Club of Pittsburgh

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Past Presidents

J. H. McCONNELL.....	October, 1901, to October, 1903.
L. H. TURNER.....	November, 1903, to October, 1905.
F. H. STARK.....	November, 1905, to October, 1907.
*H. W. WATTS.....	November, 1907, to April, 1908.
D. J. REDDING.....	November, 1908, to October, 1910.
F. R. McFEATTERS.....	November, 1910, to October, 1912.
A. G. MITCHELL.....	November, 1912, to October, 1914.
F. M. McNULTY.....	November, 1914, to October, 1916.
J. G. CODE.....	November, 1916, to October, 1917.
D. M. HOWE.....	November, 1917, to November, 1918.
J. A. SPIELMANN.....	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING,

JANUARY 22, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock P. M., Vice-President, Samuel Lynn in the chair.

The following gentlemen registered:

MEMBERS

Adams, L.	Lanahan, J. S.
Anderson, A. E.	Laurent, Geo. F.
Babcock, F. H.	Lehr, H. W.
Berg, K.	Lindstrom, Chas. A.
Branson, C. R.	Lobez, P. L.
Brant, Wm. J.	Lynn, Samuel
Brewer, W. A.	Matchett, H. K.
Briggs, Z. M.	Meeker, H. B.
Calvin, A. W.	Millar, C. W.
Charlton, W.	Mills, C. C.
Christy, F. X.	Moore, D. O.
Church, C. C.	Myers, W. H.
Clark, Harvey	McNicholl, Chas.
Conway, J. D.	McNulty, F. M.
Cox, Wm. C.	Orchard, Chas.
Crookston, W. G.	Padfield, Archie
Cunningham, F. F.	Pehrson, Alf. K.
Cunningham, H. R.	Ridley, R. C.
Dambach, C. O.	Roth, Philip J.
Durant, Chas. H.	Rowley, Chas. E.
Emery, E.	Sattley, E. C.
Forrest, C. H.	Seiss, Wm. C.
Gibson, D. W.	Sowash, Chas. B.
Gross, C. H.	Spielmann, J. A.
Hambrock, O. F.	Stauffer, A. H.
Hornbeck, W. E.	Stevens, L. V.
Howe, D. M.	Straub, W. C.
Hussong, Albert C., Jr.	Strome, H. H.
Jungbluth, Adolph	Warne, J. C.
King, J. W., Jr.	White, Charles E.
Kummer, Jos. H.	Wyrough, C. J.

VISITORS

Allison, J. R.	Gardner, Geo. R.
Brewer, George D.	Gilson, George I.
Browne, Bard	Herzog, Henry G.
Chillcot, Wm.	Lobaugh, L. G.

Lovell, J. D.
Myers, Chas. H.
O'Malley, L. J.

Nicholas, A. D.
Smith, Sion B.
Wyeth, Ross

The call of the roll was dispensed with, the record of attendance being had through the registration cards.

The reading of the minutes was by unanimous consent dispensed with.

The Secretary read the following list of applications for membership:

Bacon, John L., Traveling Engineer, Franklin Railway Supply Co., 30 Church Street, New York, N. Y. Recommended by R. M. Long.

Bowler, R. T. E., Superintendent, Machinery & Tools, B. & O. R. R., Baltimore, Md. Recommended by F. W. Gaw.

Candy, A. M., General Engineer, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Recommended by F. M. McNulty.

Church, C. R., Master Mechanic, Union R. R., 319 Larimer Avenue, Turtle Creek, Pa. Recommended by J. A. Ralston.

Gillies, W. F., Pittsburgh Manager, Ingersoll-Rand Co., 106 Chamber of Commerce Building, Pittsburgh, Pa. Recommended by F. W. Gaw.

Grady, Joseph H., Vice-President and Treasurer, The McVey-Grady Co., 983 Union Arcade, Pittsburgh, Pa. Recommended by J. F. Townsend.

Housman, Walter E., Assistant M. E., H. C. Frick Coke Co., Scottdale, Pa. Recommended by J. A. Ralston.

Kelly, J. W., Boiler Tube Expert, National Tube Co., Frick Building, Pittsburgh, Pa. Recommended by F. M. McNulty.

Lightfoot, Thomas E., Engineer, Railway Steel Spring Co., 1819 Ligonier Street, Latrobe, Pa. Recommended by H. E. Chilcoat.

Murphy, W. J., G. B. F., Pennsylvania R. R., Ft. Wayne Shops, N. S., Pittsburgh, Pa. Recommended by D. H. Amsbary.

McNicholl, Chas., Division Freight Agent, American Bridge Co., 1462 Frick-Annex Building, Pittsburgh, Pa. Recommended by J. F. Townsend.

Wagner, Frank, Inspector of Const., U. S. Railroad Administration, 708 Centennial Avenue, Sewickley, Pa. Recommended by John E. Haynes.

PRESIDENT: As soon as these applications have been approved by the Executive Committee the gentlemen will become members without further action than the payment of one year's dues.

The Secretary announced the death of Mr. D. C. Courtney, one of the charter members of the Club, which occurred January 19, 1920. The President directed that a proper memorial minute be inserted in the Proceedings.

There being no further business, the paper of the evening was presented by Mr. D. W. Gibson, Superintendent of the American Railway Express Company, on "The Express Service and Present Day Relations with the Railroad."

Mr. Chairman, Members of the Railway Club of
Pittsburgh, and Guests:

It is indeed a pleasure to be permitted to be with you this evening and the privilege of addressing you on a subject that has had considerable to do with the transportation facilities of this great country of ours and which service has also found many commercial avenues in every part of the globe.

EXPRESS SERVICE AND PRESENT DAY RELATIONS WITH THE RAILROAD OPERATION.

The first pioneer in the express business was Wm. F. Harden who began operating about 1836 by carrying a carpet bag between Worcester and Boston, Mass., later extending his activities to Providence, R. I., and from there to New York, by using the boat lines, confining his operations largely to the handling of commissions and small valuable packages and money. Later, in 1841, he associated himself with Henry Wells of Albany, N. Y., and by a com-

bined service of boat, rail and stage express service was inaugurated through to Buffalo, operating under the name of Pomeroy & Co. In 1846 Mr. Wells transferred his interests to W. A. Livingston from which the United States and Canada and American Express Companies emanated. Mr. Wells moving to California and became one of the organizers of Wells Fargo & Co., beginning with the pony express that first crossed the country in 1859, blazing their trail from St. Joseph, Mo. to Oakland, Calif. The first regular schedule started April 3, 1860, when the riders left St. Joseph, Mo., also Oakland, Calif. at the same hour, the schedule consuming a little over 11 days, which were run in relays of 10 miles each, averaging approximately 250 miles per day; the route taking them via Fort Kearney, Neb., Salt Lake City and Carson City, Nevada, thence through the Sacramento Valley to Oakland, where boat was taken for San Francisco. This service later supplanted by stage coaches, then by the railroads except in some remote district.

The service, then, as today, was a personal one, differing from any other line of transportation. To other large transportation mediums the public usually brings its patronage, while the Express Company goes to the public to receive or deliver its traffic and by so doing comes in closer personal contact with its patrons. The transaction possibly would be a business one, or on the other hand, one of utmost importance to the household, such as the handling of their personal baggage, a present to a distant friend or performing some commission, at a far distant point. Oft times the express is called upon to transfer the horses, automobiles and domestic animals connected with the household, from their summer home in Maine to their winter villa in Florida or the sunny slopes of California. The intimate and varied nature of the transactions calls for a close relation between patron and Company, also requires the greatest of detail in supervision. There is no limit to the class or character of the consignments or commissions that the present day Express Agent is not called upon to handle; starts the days business by selling a Money Order for which the revenue could be five cents, the next, arrang-

ing the movement of some special piece of machinery, to prevent a mine from flooding, or the stoppage of a lighting or water supply in some of our large cities.

At the time the government took on the operating of the railroads in this country the following express companies were in the field: The Adams, American, Southern, Wells Fargo & Co., Great Northern, Northern and Western. The last three being confined to their respective systems of railroad; Great Northern to the Great Northern, or so-called Hill system, Northern to the Northern Pacific, and Western to the Soo or Canadian Pacific interests in this country. The combined mileage of the several companies at that time totaled nearly 290,000. The mileage under government control being approximately 180,000, smaller or independent lines making up the difference between the two totals all of which was merged into the American Railway Express Co. at the time it became the Express Agent of the government for handling express matter on all government-controlled railroads, operating under an agreement, the Company to pay the Railroad Administration $50\frac{1}{4}$ percent of gross revenue earned on the transportation of express matter, as compensation for the railroad transportation, without any guarantee as to the net result. (You will note the difference when compared with the Government's contract with the railroads.) At the same time the A. R. E. Co. took on the contracts of the old Express Companies covering the operations of the short line railroads not under government control, also various inland water routes, stage lines, including the Wells Fargo & Co.'s activities in Alaska, Hawaii and the Orient, that Company having extended its service early in 1900 to the interior of Alaska or the frozen north (commonly referred to for years as the Seward Ice Box, but comprising a tract of over 577,000 square miles of territory or about equal to the area of this country east of the Mississippi River, and has been producing large quantities of gold and other minerals) and in many places the company were using dog-drawn sleds as a medium of transportation during the months when navigation was closed on the rivers and for cross-country communications and connections from various seaports and the two or three

short systems of railroad, this venture being one of the most extraordinary and hazardous undertaking in the history of express transportation. The principal traffic consisting of bullion, furs and supplies, the open season for operating was from June to October and carried on without much difficulty.

You will readily appreciate that the business is one of infinite detail. The nature of its traffic as well as the necessary adjustments with the large number of railroad and other mediums of transportation including the various interchanges in routing, necessitates volumes of records, all of which go to make an expensive operation. In other words, it costs more to count their money than most any other line of business.

The old companies were termed common carriers and brought under the control of the Inter-State Commerce Commission shortly after its organization, but there was little or no change in the operation until October 15, 1913, when there was a general change made in the system of rate-making, adopting the so-called zone system, which was made by dividing the country into blocks approximately 50 miles square, each block divided into nine zones, each zone into sixteen sub-divisions, in order to equalize the charge between long and short haul traffic; classifying all traffic into three classes:

1st class—General Merchandise.

2nd class—Comprising all food products, articles of eatables and drinkables, except (booze or beer).

3rd class—Consisting of printed matter and periodicals.

The system working very similar to that employed by the government in determining of parcel post charges. The zone system simplified our rate-making, also reduced many of the long-haul rates, increasing a number of the local or short-haul charges, at the same time there was inaugurated a new system of handling and accounting each of the old companies., maintaining their own general system, taking on a uniform method of transfer and interchange of business between companies. All of this worked for the general

good of the service, until the business condition changed during the year 1917 largely incident to the war and the old companies were unable to secure the necessary readjustments of their tariffs to meet increasing expenses. As a result, July 1, 1918, when the service was taken over by the government, the equipment and forces were depleted and taxed to their utmost in the almost exclusive movement of war materials, munitions and the handling of supplies to help win the war. Out of this state of affairs grew numerous embargoes on ordinary traffic; terminals quite often congested through the shortage of baggage or express car equipment.

In order to relieve this situation several hundred freight cars were equipped with high speed wheels, air brakes, whistles, etc., that they could be handled in the exclusive express trains or passenger service, which materially aided in the moving of the heavy or carload shipments, and we are continuing to use this character of cars today account of the continued shortage of regular equipment, but am sorry to say that with our returning to more normal conditions with traffic, these converted cars, do not meet our requirements, as they cannot be worked in local service or ridden by our messenger, not being equipped with light, steam, or the necessary appointments. As a result, at the present time the efficiency of the business is suffering for lack of adequate cars to properly handle the traffic.

With the unified service and through routing that was accomplished immediately after the consolidation we were soon able to relieve the congestions at the larger terminals and more readily handle the heavy traffic by the consolidating and through routing of cars, in some instances confining the traffic between two large centers to one road, moving same in special trains, aiming at all times to keep the traffic as a whole equally divided between the various roads in proportion to the percent previous to the consolidation. At the time the armistice was signed, we supposed we had reached the peak with the volume of traffic, thinking it would never be equalled; there was an immediate falling off of traffic which was only of short duration. Latterly we have been exceeding the volume that existed during

the war, which we have only been able to handle without congestion, and with a minimum of delay through, the benefits derived from the consolidated service, avoiding transfers to the greatest extent practicable, at the same time keeping the loss and damage within bounds, working toward the 100% mark in operation—as near as possible, and to my mind with a settled business condition in this country, with our business policies firmly outlined we would enjoy one of the greatest areas of prosperity in all lines of business that our commercial interests have ever enjoyed or even dared dream of and it would come almost over night—if our Congressional brethren would settle down and outline a definite plan of business principals instead of jockeying for political position.

The year 1919, in the Express Service, was an eventful one. Early in January an S. O. S. was sent out by inaugurating the so-called "Better Service Campaign," the big drive started February 10th at the same hour throughout the country, in which we urged better handling, better marking and better packing. Such a wide campaign of education in transportation circles was never before possible; in every city, town and hamlet from the Atlantic to the Pacific, from the Great Lakes to the Gulf, wherever we maintained our exclusive service, employes were gathered together and matters pertaining to the giving of better service were discussed. This comprised an army of nearly 135,000 employes scattered throughout the United States. Since that date frequent meetings have been called to discuss the various problems, committees appointed, that did scout duty, among employes and shippers, with the view of bettering conditions. The result has been marvelous; Over Without Mark has been reduced to comparatively nothing, the warehouses that were being maintained for storage of this matter have been released or rented, claim for loss and damage have been cut in two and are still being reduced. And I look for further results with the uniform packing rules governing our shipments, that were made effective December 10, 1919. They are compiled along the same lines as the packing requirements outlined by the freight classification, which brings the two mediums in

closer relations in respect to the movement of traffic and helps to eliminate the loss and damage and dissatisfaction with patrons. The same rule now applies to both the freight and the express except in some minute details as applying to their respective traffic, which seldom, if ever, moves by other than the one service.

I mentioned at the beginning the change in rates and system of accounting. I wish now to dwell for a moment on the beneficial feature in the new system of waybilling and labeling that was adopted on December 1st, doing away with the seven different systems formerly maintained by the old companies and continued by the A. R. E. Company account inability to secure necessary supplies and printing to make the change earlier. It has done more in the short time that it has been in operation to facilitate the movement of our traffic than any one change in the history of the business.

This new master waybill comprises a blank of 8 parts and when folded, by a system of carbons when writing the shipper's receipt, or bill of lading as called in the freight service the one operation not only makes the receipt, but the delivery sheet, abstract advice, waybill and office record. Waybill label and delivery sheet being attached to the shipment, goes through to destination when it is detached and used at the time of effecting delivery to take receipt from consignee. The various parts of the waybill carry a system of serial numbers for identification and are also printed in two colors, white for collect and yellow for prepaid consignments, the color scheme materially facilitating the handling—particularly at the large centers. In the large cities we have not exclusively adopted the master waybill as it would have necessitated abolishing all old forms of shippers records and special forms of receipts, and we have as a substitute, a waybill without the shippers receipt attached, but carrying all other features.

The simple method of identification of the new form appeals to many of the large users of our service, as it leaves with the shipper the complete copy of our forwarding record as well as receipt, all of which is essential in

event of necessity for trace or claim. As to the latter: it works for the mutual interests of shipper and company; no chance for changing or substituting of records. Large shippers are asking to be supplied with the blank waybills and are filling same out in their traffic or shipping departments and when receipted for by the Express Company representative and the shipments leave their places of business they are ready to be loaded in the cars and can be immediately started on their journeys; no delay at depot for weighing, billing, etc.

The prospective return of the railroad to private ownership has caused considerable comment and speculation as to the adaptability of this new form of waybill owing to the trouble that would be experienced in the division of earnings between the various roads. This feature, I think, has been overcome by a system of stamps that are to be placed upon the waybill while attached to the shipment as it passes over certain lines or through transfer points, and as these waybills reach the auditor the division of charges according to mileage can be readily apportioned. It is not necessary to stamp the waybills for traffic local to the road as the office or route number showing point of origin would determine railroad over which the traffic moved.

Some of the features that the old as well as the new company has specialized with has been confined largely to food product, or the second class traffic. This season of the year we are handling strawberries in the Pony Refrigerators from Florida to the northern cities, the quantities not large enough to warrant use of regular refrigerator cars that are used as the crop develops and the markets demand larger quantities. About February 10th the green truck will commence moving in car lots from Texas as well as other southern points; as the season advances and the various crops develop, the first movements are generally confined to express service when the freight steps in and handles the heavy tonnage and exclusive car lots; the latter is particularly applicable to the strawberry and melon industry. The cantaloupe traffic has been an interesting one and it is largely due to the activities of the Express that the growth has been so extensive. When the Rocky Ford melon first

appeared in our markets it was through the solicitation of one of the Express Commercial Agents that a farmer in Colorado was induced to enlarge on his output. He to find the markets. The first season only a few dozen crates were forwarded, the next about that many hundred crates, and it has been increasing ever since. The experience was quite similar in California. Also in Indiana and other localities where the industry was first undertaken. The development of the Indiana field, one of the latest, and the growth has been the most pronounced. I was personally acquainted with those directly interested. The first year only fourteen crates were marketed, now there are hundreds of carloads from the same section, largely moving via freight, after the shipping season is well under way.

The cherry shipping from California forms an important feature each season and account of its highly perishable nature moves almost exclusively for the long haul via Express, the Company having its own line of refrigerator cars that have been especially constructed, for the handling of this highly perishable traffic, which has been done with good satisfaction to both grower and carrier.

Live Fish for market purposes is another product that latterly and at this season of the year comes in for its share of mention and one that the public knows little of, account of the comparatively few people engaged in the handling, which requires a specially constructed system of tanks built in an ordinary express or baggage car equipped with pumps for the furnishing of fresh air and water while enroute, requiring an attendant constantly in charge, cars being leased by the year to the shippers.

This traffic first started from Sandusky, Ohio, when the fisherman of Lake Erie commenced to devise means of marketing the Carp that was found very plentiful in and about the Sandusky Bay, they having in mind two objects: first the marketing of their catch, second, an endeavor to exterminate, that specie of fish, they being very prolific, spawning three times a year, one of, and its principal foods, being the spawn and fry of other fish. As a result they were destroying the other or better grades of fish. Latterly in

Illinois, Wisconsin, Iowa and other Central west localities there has been a movement on foot to exterminate the Carp from the small lakes by a system of seining. The dealers or lessees of the specially constructed cars have purchased this catch at a small price per pound and shipping same to New York where they have found ready market throughout the east side of the City and at good prices, among the Hebrew families who have a special way of preparing this fish that makes a very delicious dish.

Account of the requirements and care while enroute our freight competitors as yet have not entered the field.

The class of traffic usually called L. C. L. with our freight competitors: it is contended a good portion of same is being diverted to the express service for none other than economical reasons. Many traffic departments formerly assumed that freight charges on a shipment were always less than express, but with the later-day study of economics and costs, it has been the cause of changing a portion of this traffic. Formerly shippers seldom, if ever, gave any attention to the cartage cost, but as soon as these costs began to be analyzed it was found that express charges were often less on ordinary shipments of one or two hundred pounds due to their being handled direct by the Express Company, eliminating any costs to and from their shipping rooms. The same condition exists to a certain extent in respect to the carriers. The railroad on this class of traffic receives its $50\frac{1}{4}\%$ of the tariff charge and has nothing to do with the handling other than furnishing and hauling of the cars; the risk, accounting, etc., being eliminated. In other words they receive their money in a lump at the end of the month and do not have to worry about the delivery or loss and damage.

Operating. Another feature to which I wish to invite our operating brethren's attention; and that is the net revenue accruing from the traffic to the railroad for the facilities afforded the express in the end of baggage or generally, the head car of the train. Analysis often has developed an equal earnings per train mile when compared with other cars in the train; and instances are not infre-

quent when the average equals that of the passenger fares per mile for the train and realized with a minimum of effort or cost on the part of the railroad operators.

The express car, serves many patrons, of the railroad that are unknown factors, at the time. The mute package or box, cannot intercede for itself or explain the necessity, of its mission, neither can it make the transfer at the junction as does the traveler, but the consignee has the same general interests as the passenger, both investing the same kind of money in transportation, commonly called passenger service.

Mr. Operator, please keep a few of these features in mind when confronted with the problems of trying to lighten up a train or make up for some delay or other difficulty. The cutting out of an express car, or the leaving of a connection, or consignment, has in some instances been the easy method in operating, and apparently has occasionally been done without giving due consideration to the effect, other than to obtain immediate relief. There is no way of measuring the effect or final result; we are both serving the same communities. Any mention of failures made, is done with no personal criticism, our interests are mutual and the references are made with the view of the general betterment of the transportation service.

I wish to again thank you for this privilege of talking to you and will conclude with a few pictures of some of our principal activities, also some other transportation and scenic views.

Mr. Gibon then displayed a reel of very interesting pictures identified with the express business.

PRESIDENT: Since the presentation of Mr. Gibson's paper and the illustrations I am sure we all have a better insight into the difficulties the express companies are up against. The paper is now open for general discussion or questions.

MR. J. A. SPIELMANN: I wish the speaker would explain a little more in detail in connection with the new form of labels which the speaker has shown us with holes.

MR. D. W. GIBSON: The sheet of part next to shipment is perforated with a view of the paste adhering better, also make smooth surface for better adhesion to the shipment of the label which carries the identification number and forms a protection or cushion for the delivery sheet and waybill which are folded immediately over the label. By carefully applying, very few become detached enroute; tests so far made indicate about 95% reach destination attached to shipments in good shape. The numbered label remaining on the shipment when delivered gives consignee a medium of identification as the number corresponds with the receipt, delivery record, also waybill.

MR. J. A. SPIELMANN: When you fold the waybill over is there any arrangement to hold it down?

MR. D. W. GIBSON: Nothing except the perforated edge which is left on shipment when waybill and delivery sheet are detached. In other words, there is an extension on the edge of waybill to give the same adhesive protection as is given the label.

MR. D. M. HOWE: The speaker dwelt somewhat on the fact that they received a good many packages which do not have the consignees' names and addresses. Why would your employes at the many stations receive these articles not properly marked?

MR. D. W. GIBSON: Their shipments were started out with marks of such delicate nature that they would not carry to destination. The marks became detached in handling either because of the flimsy tag or calling card or something of a similar nature used in tracing shipment.

MR. D. M. HOWE: I have received in my office a letter from your Company about the proper marking of packages. I think this has alleviated the loss of many of them.

MR. C. O. DAMBACH: The government, I understand, has changed the carrying of mails from a weight to a space basis. Has that had anything to do with requiring more of your space or have you any figures on the subject in a car occupied for that use.

MR. D. W. GIBSON: I have no figures on that subject. During the war there were several hundred baggage cars from various systems all over the country converted to so-called kitchen and camp cars. These cars were taken out of regular express passenger equipment and kept in readiness at military camps to move troop trains with the least possible delay. These cars were first taken out of the express service during the Mexican trouble and the number materially increased from time to time after we got into the war with Germany. If I am not mistaken, at the time the Armistice was signed there were four or five thousand of these cars assigned to the use of the government and equipped with stoves, tanks, kitchen utensils, and kept in readiness for immediate use in the movement of troops.

MR. J. W. KING, JR.: I would like to ask Mr. Gibson to explain one matter that came to our attention this morning. One of the large shippers of railway supplies notified us that they were holding some material ordered, for the reason that the Express Company refused to accept it. They explained that the destination points were non-agency points. This seems to be a new departure from the custom that has prevailed heretofore. Now a great many mines are not located at agency stations, for which reason it is often necessary to have shipments consigned to the mine. The holding up of that material is a very serious matter to some of our mines.

Another thing. I understand that shipments consigned to non-agency points are carried past sometimes two, three or four times, and that the billing instead of being handled by the next agency beyond the point of destination is being cared for by an agent at a terminal point. I do not know just what the scheme is to have a man at the terminal of the road handle these non-agency shipments, but it is certainly causing a great amount of trouble to us in connection with shipments at some of our mines. The fact that we are not able to get repair material to our mines quickly seriously interferes, due to the fact that where we make shipment by express we need that material quickly, and to be held up a day or two on account of the refusal of the express company to accept means a great injury.

MR. D. W. GIBSON: There was a recent ruling made whereby the method of handling non-agency or put off material was taken up and published. Prior to that time there had been some confusion with the instructions, but by this ruling there was a fixed plan established whereby shipments destined to a non-agency point or what is commonly called "a put off stop" where there is no agent or facilities for receiving or receipting for shipments, that the Company would accept the consignment and attempt to handle it to that put off point if the charges were prepaid and the Company released from any responsibility in connection with the shipment after it was put off the train. If the shippers would not release such shipment it would be handled to the nearest regular express agency where it could be called for by consignee. There was quite some contention by shippers over this ruling, the Company heretofore being called upon to entertain numerous claims on a lot of traffic on which they attempted to accommodate the shipper and handled to a non-agency point.

If Mr. King or consignees will arrange for their shippers to release such consignments and prepay charges, shipments will be put off wherever they are directed. If the shipper will not release and prepay the charges they will go to the station designated for handling such non-agency point business.

As to the taking of receipts at non-agency points—that is out of the question. Station time of train will not permit and there is only a small percent of the traffic put off at non-agency points where the consignee is there, ready to accept. We have been asked to try and trace some of these consignments and have gone to the non-agency points and found the container of the shipment that it was contended had never reached consignee, secreted in a fence corner or some distance from the station in an adjoining field, with contents gone. This illustrates that it would be foolish for the company to attempt to accept responsibility for traffic handled under such conditions in an attempt to accommodate the public. We are now attempting to have our messengers make script for all consignments, showing train handling and the date put off.

MR. E. C. SATTLEY: I believe I express the sentiment of all present when I say that we have been greatly instructed and highly entertained by the very able address and the beautiful and interesting pictures presented by the speaker of the evening. Therefore I move a rising vote of thanks be extended to the speaker.

The motion prevailed.

MR. A. E. ANDERSON: I would like to ask a couple of questions more. This record and these pictures illustrate such a wide variety of shipments, it might be of interest to know as a matter of contrast what is the largest shipment handled in the way of value, also weight, and also the smallest. And then the other question, which is of great interest to me, arises from the statement of the speaker that shippers are learning that it is cheaper to ship by express than by freight, for it has always been considered that freight charges are measurably less than express charges—but that the terminal charges at both ends of the trip, furnished by the express company, take away any advantage of the freight. I would like to ask if there is any proportion or figures as to how the costs of collection as well as delivery of shipments compare with the rate charged between the points of shipment and delivery.

MR. D. W. GIBSON: The average is about 20 percent, as I recall it. I have no definite figures. There was what is called a terminal allowance or a charge of 20 percent.

As to the largest shipment in value, I would not attempt to guess. We are handling all kinds and quantities. Possibly, the one referred to on the screen, 55 million in gold, would be the most valuable shipment we have handled in some time. Often handled two and three train loads of bullion. The largest particular shipment that I recall and have any personal knowledge of or connection with, was a shipment of five pieces weighing about 115 tons.

There being no further discussion.

The meeting upon motion adjourned.

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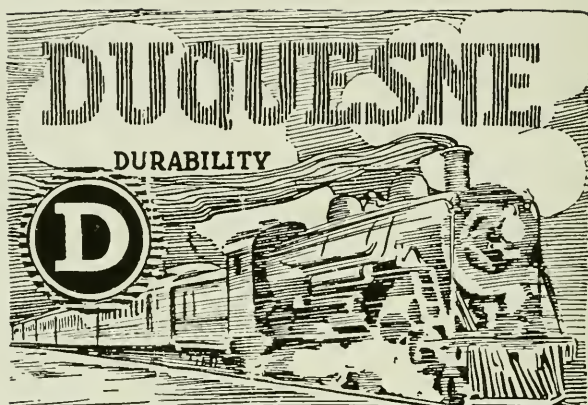
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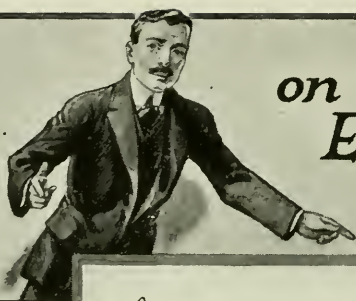
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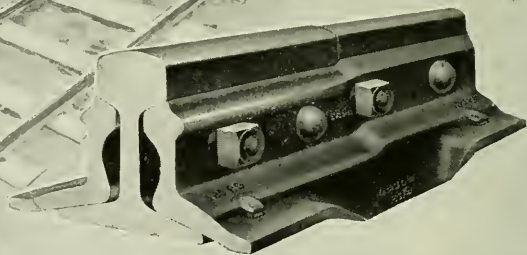
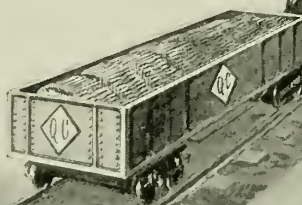
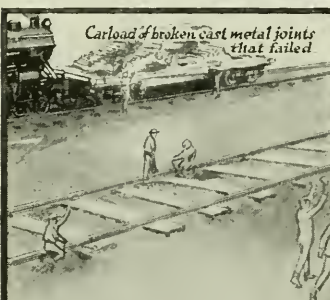
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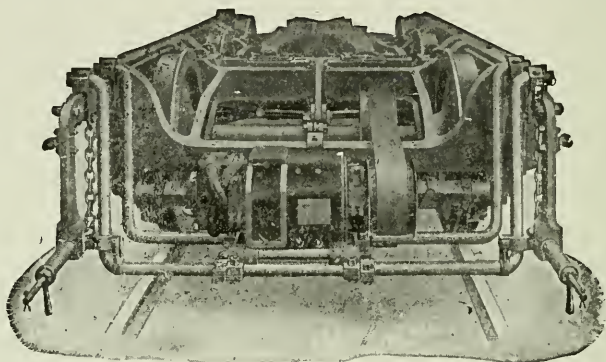
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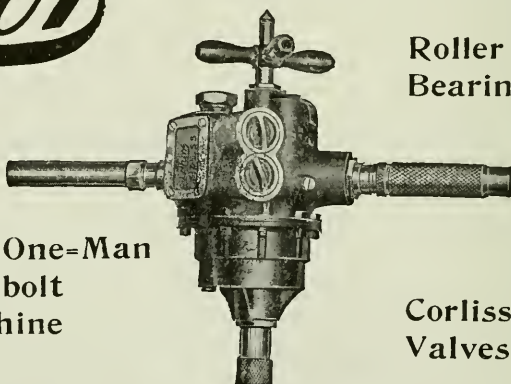
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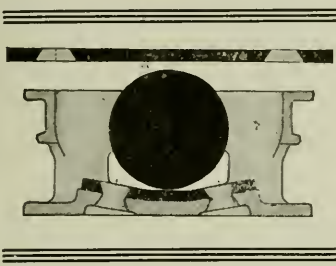
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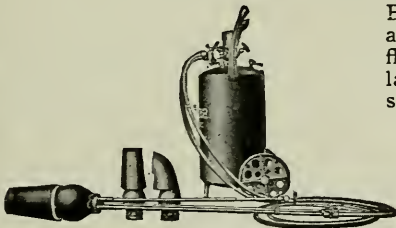
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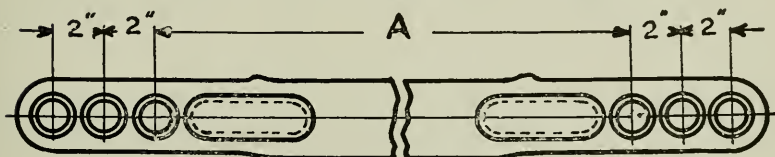
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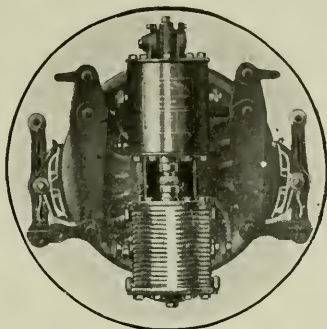
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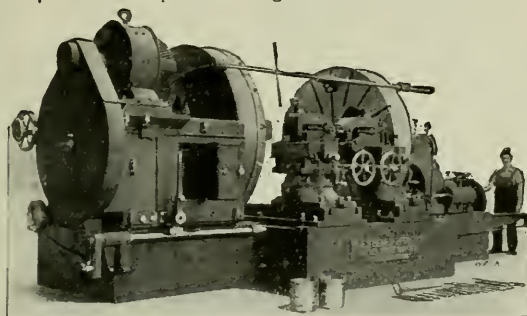
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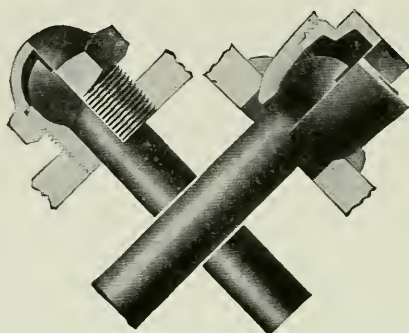
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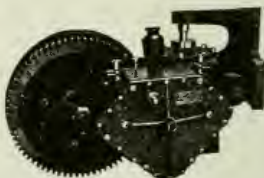
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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of February, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"What the Railroads Must Do After March First" by James H. Hustis, President of the Boston & Maine R. R., and L. F. Loree, President of the Delaware & Hudson and Kansas City Southern R. R.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Scientific Methods in Employment Management" by Edgar James Swift, Professor of Psychology and Education, Washington University, St. Louis, Mo.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Not received.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"Paper and Discussion on Thermit, Electric and Oxy-Acetylene Welding" by W. H. Ludington.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"Transportation Activities of the U. S. Department of Agriculture" by I. N. Randall, Assistant in Transportation, Bureau of Markets, U. S. Department of Agriculture.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—Not received.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"The New Baldwin-Westinghouse Chicago, Milwaukee & St. Paul Electric Locomotives" by N. W. Storer, General Engineer of the Westinghouse Electric & Manufacturing Company.

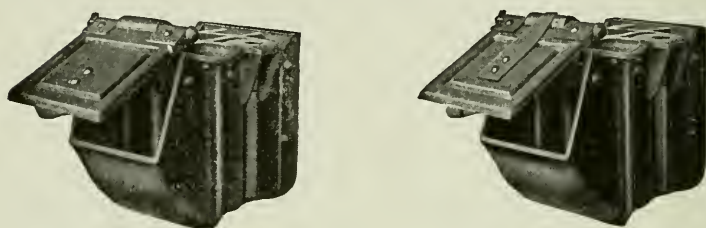
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Pittsburgh, Pa., Feb. 26, 1920

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Past Presidents

J. H. McCONNELL.....	October, 1901, to October, 1903.
L. H. TURNER.....	November, 1903, to October, 1905.
F. H. STARK.....	November, 1905, to October, 1907.
*H. W. WATTS.....	November, 1907, to April, 1908.
D. J. REDDING.....	November, 1908, to October, 1910.
F. R. McFEATTERS.....	November, 1910, to October, 1912.
A. G. MITCHELL.....	November, 1912, to October, 1914.
F. M. McNULTY.....	November, 1914, to October, 1916.
J. G. CODE.....	November, 1916, to October, 1917.
D. M. HOWE.....	November, 1917, to November, 1918.
J. A. SPIELMANN.....	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING

FEBRUARY 26, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock P. M., with President H. H. Maxfield in the chair.

The following gentlemen registered:

MEMBERS

Adams, L.	Gross, Chas.
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Barratt, R. D.	Harn, C. B.
Berg, K.	Harris, C. M.
Berghane, A. L.	Harsh, H. H.
Bloom, Edw. B.	Hornbeck, W. E.
Boder, James F.	Howe, D. M.
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Brant, Wm. J.	Hyndman, F. T.
Brand, H. B.	Innes, H. W.
Briggs, Z. M.	Jungbluth, Adolph
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Cartwright, Wm. E.	Kelly, Leo J.
Chalker, A. R.	Kerby, F.
Christy, F. X.	King, C. F., Jr.
Clark, Harvey	Knapp, A. D.
Dambach, C. O.	Knox, Wm. J.
Donahoe, F. F.	Krepps, T. S.
Donaldson, Harold R.	Kummer, Jos. H.
Durant, C. H.	Lanahan, J. S.
Dyck, Walter E.	Landgraf, F. K.
Eckroate, W. H.	Laurent, Geo. F.
Eisenbeis, W. H.	Lawson, A. F.
Elverson, H. W.	Laylin, M. H.
Ferguson, T. S.	Lehr, H. W.
Finney, H. F.	Lent, John F.
Forrest, C. H.	Lloyd, John A.
Freshwater, F. H.	Lobez, P. L.
Frey, Albert R.	Long, R. M.
Gaw, F. W.	Lowe, W. D.
Gilg, Henry F.	Lynn, Samuel
Gobrecht, J. C.	Matchett, H. K.
Gorman, John C.	Maxfield, H. H.
Graham, E. A.	Meeker, Harry B.

Millar, C. W.
 Mills, C. C.
 Mode, H. C.
 Moore, D. O.
 McCarthy, W. T.
 McDowell, D. W.
 McGregor, D. C.
 McKinstry, C. H.
 Nelson, W. O.
 Nieman, H. L.
 O'Connor, M. J.
 Orchard, Chas.
 Osterrieder, A. J.
 Padfield, Archie
 Parker, W. D.
 Peirce, E. C.
 Price, W. F.
 Redding, D. J.
 Reich, F. C.
 Rick, R. C.
 Rowland, W. H.
 Rowley, Chas. E.
 Ruben, J. W.
 Ruhling, J. V.

Runser, K. W.
 Salisbury, S. W.
 Schofield, J. S.
 Searles, E. J.
 Sewell, H. B.
 Snyder, R.
 Spielmann, J. A.
 Stark, F. H.
 Stevens, L. V.
 Storer, N. W.
 Straub, W. C.
 Strome, H. H.
 Stucki, A.
 Taylor, L. C. G.
 Van Vranken, S. E.
 Vowinkel, F. F.
 Walther, G. C.
 Washburn, A.
 West, John W.
 White, William T.
 Wildin, G. W.
 Williamson, J. A.
 Wright, John B.
 Wyrough, C. J.

Zitzmann, F. A.

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 Riddle, Elmer H.
 Rosenberg, L. H.

Schauer, Walter M.	Stinemetz, W. R.
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Smith, Sion B.	Westenhaver, L. J.
Spanagle, D. B.	Williams, R. W.
Stillings, Wm. R.	Williams, W. P.

The call of the roll was dispensed with, the record of attendance being had through the registration cards.

The reading of the minutes was by unanimous consent dispensed with.

The Secretary read the following list of applications for membership:

Berlin, Ralph Q., C. C. Transportation Department, Carnegie Steel Works, Braddock, Pa. Recommended by R. S. Wilson.

Browne, Bard, Rep., Locomotive Superheater Co., 30 Church St., New York, N. Y. Recommended by F. M. McNulty.

Carr, Paul D., Car Service Clerk, Carnegie Steel Co., 153 Mills St., Braddock, Pa. Recommended by R. S. Wilson.

Dixon, W. J., Superintendent Transportation and Labor, Carnegie Steel Co., 810 Kirkpatrick Ave., North Braddock, Pa. Recommended by R. S. Wilson.

Gorby, Frank E., Clerk, Union R. R., Care B. P. O. E. No. 11, Pittsburgh, Pa. Recommended by R. S. Wilson.

Greenaway, Richard D., Clerk, Union R. R., 1216 Glenn Ave., Wilksburg, Pa. Recommended by R. S. Wilson.

Grimes, E. Oliver, Jr., V. P. & G. M., The Liberty Tool Corporation, 1318 Munsey Bldg., Baltimore, Md. Recommended by M. J. O'Connor.

Gummere, W. R., Salesman, Independent Pneumatic Tool Co., 1208 Farmers Bank Bldg., Pittsburgh, Pa. Recommended by Samuel Lynn.

Hughes, Joseph A., Superintendent Transportation, Carnegie Steel Co., 115 S. Fourth St., Duquesne, Pa. Recommended by R. S. Wilson.

Joseph, A. M., Clerk, B. & L. E. R. R., 727 Union Arcade Bldg., Pittsburgh, Pa. Recommended by R. S. Wilson.

Klinefelter, D. W., Car Service Clerk, Carnegie Steel Co., 1145 Grant Ave., Duquesne, Pa. Recommended by R. S. Wilson.

Lawler, Joseph A., Assistant Superintendent Transportation, Carnegie Steel Co., 208 Hawkins Ave., Braddock, Pa. Recommended by R. S. Wilson.

Michaels, David, Machinist, P. R. R., 525 Penn St., Verona, Pa. Recommended by H. W. Innes.

McCarthy, Francis R., Car Distr., Carnegie Steel Co., 222 Second St., Braddock, Pa. Recommended by R. S. Wilson.

McCormack, T. J., Yard Master, Carnegie Steel Co., 328 Grant Ave., Duquesne, Pa. Recommended by R. S. Wilson.

McCue, Francis J., Clerk, Carnegie Steel Co., 216 First St., Braddock, Pa. Recommended by R. S. Wilson.

North, J. Gordon, Secretary and Treasurer, Pittsburgh Power Reverse Gear Co., 307 Cremo St., N. S., Pittsburgh, Pa. Recommended by Alfred S. Osbourne.

O'Connor, John F., Trav. Fire., P. & L. E., 420 Pacific Ave., McKeesport, Pa. Recommended by A. Washburn.

Redding, R. D., Salesman, Johnston Bronze Co., 3263 Ashlyn St., 20th Ward, Pittsburgh, Pa. Recommended by D. J. Redding.

Regester, Samuel D., General Foreman, Carnegie Steel Co., 49 N. Second St., Duquesne, Pa. Recommended by R. S. Wilson.

Ruben, J. W., Agent, Pacific Fruit Express Co., 3203 Camp St., Pittsburgh, Pa. Recommended by Chas. Gross.

Sheats, Charles O., Clerk, Union R. R., 1811 Hanover St.,
Swissvale, Pa. Recommended by R. S. Wilson.

Speedy, Fulton E., Engineer, Union R. R., 137 Mills Ave.,
Braddock, Pa. Recommended by J. W. Wyke.

Stonick, E. A., General Yard Master, Carnegie Steel Co., 15
Kemper St., Pittsburgh, Pa. Recommended by R. S.
Wilson.

Teichart, Arno B., Foreman, Carnegie Steel Co., 1130 Carl
St., Duquesne, Pa. Recommended by R. S. Wilson.

Teichart, Ernst G., Road Master, Union R. R. Co., 1027
Lincoln Ave., Duquesne, Pa. Recommended by R. S.
Wilson.

Williams, R. W., Repr., Westinghouse Air Brake Co., 200
Westinghouse Bldg., Pittsburgh, Pa. Recommended by
L. V. Stevens.

PRESIDENT: As soon as these applications have been
approved by the Executive Committee the gentlemen will
become members without further action than the payment
of one year's dues.

The Secretary announced the death of Mr. Theodore
Titus which occurred February 5th, 1920, L. H. Turner, Jr.,
which occurred on February 9th, 1920 and Joseph M. Flan-
nery, which occurred on February 18th, 1920.

The Secretary presented invitation from the American
Institute of Electrical Engineers to attend their meeting
March 12th, 1920, William Penn Hotel, Pittsburgh, Pa. An
afternoon session 2:30 P. M. and evening session 8:00 P. M.

The Secretary was instructed to convey thanks for the
invitation.

There being no further business, the paper of the even-
ing was presented by Mr. N. W. Storer, General Engineer,
Westinghouse Electric & Manufacturing Co.; subject:

**"THE NEW BALDWIN-WESTINGHOUSE CHICAGO,
MILWAUKEE & ST. PAUL ELECTRIC
LOCOMOTIVES,"**

being illustrated by pictures.

MR. N. W. STORER: Mr. President and Members of the Railway Club of Pittsburgh: One of my friends very kindly volunteered to help me entertain the Club this evening. Knowing how feeble my efforts will be, he prepared some films which he will put on the screen before my speech takes place.

The moving picture, "THE ROMANCE OF RAILS AND POWER," which showed several of the principal steam railroad electrifications in operation.

MR. N. W. STORER: Tonight my talk is to be confined practically to the locomotive. We do not pretend to be able to electrify all the roads in the United States right away, or even ultimately to electrify all of them. But what we do believe and what we think has been substantiated on the roads which have been electrified is that in spite of the magnificent work which has been done with steam locomotives and while steam locomotive has been so vastly improved in the last twenty years, we believe that we can do the work better and do more of it with the electric locomotive than you can possibly do with steam.

Wherever the limit to the capacity of the road is set by the motive power, I believe the electric locomotive will increase the capacity. For instance, on the heavy, two percent grade encountered on the Norfolk & Western where the boiler capacity necessarily limits the speed of the big Mallets to seven miles per hour, the electrics are pulling the train up the hill and holding it back going down at fourteen miles an hour. This illustrates one of the characteristics of the electric locomotive service. Wherever the capacity is limited by the capacity of the locomotives it can be increased most effectively by electrifying. It is much safer in tunnels because of the elimination of smoke and is certainly much safer on grades because of the regenerative features of which I will speak later. As for terminals of course there is no comparison. Whether or not it pays in dollars and cents, the terminals should be electrified in all our large cities in the near future. When it is finally done I believe without question it will pay financially.

There are so many advantages in handling trains in terminals electrically that I don't think there is any man

in the United States, or possibly, in the world, who has the vision to see all of the advantages that have been or can be gained by it. It is more than simply a change in motive power. It changes the whole character of the neighborhood. Where the smoke and dirt is at present a great limitation and draw-back to the centers near the railroads, electrification will so improve the conditions that these centers will be just as desirable for office buildings or hotels as any other part of the city. This has been shown in New York around the Pennsylvania and Grand Central Stations. In the vicinity of the Grand Central a special effort has been made to improve the surrounding territory and buildings and it has been quite a financial success.

I am going to show you tonight some pictures of the locomotives which have been put in operation on the principal electrifications within the last few years, confined of course to the ones the Westinghouse Company have installed. I do not have any other pictures. I will then show you the latest product which we have made and which some of you saw this afternoon,—the Baldwin-Westinghouse C. M. & St. Paul 3000 volt D. C. passenger electric locomotive. As I have said, I do not pretend to say that the steam locomotive is a thing of the past. Everybody knows it is not. It is doing wonderful work. But we claim to have something that will do it just a little better, that is all.

There has been a great deal of talk lately on the advantages of electrification, especially the economies connected with it. My feeling is that the things that are going to force the issue in many places are, first economy of fuel, and second, labor problems. The electrification of a railroad will save somewhere from one-half to two-thirds of the fuel which is now used by the railroads. That runs up into very large figures. For instance in 1916 in this country the railroads consumed 142,000,000 tons of coal. That is about 25 percent of all the coal mined in this country and you can see that it is a very substantial amount. The saving which might result from half the railroads being electrified, if we have the normal increase in tonnage, will amount to somewhere in the neighborhood of 50,000,000 tons a year.

(The Speaker then showed a large number of slides,

describing them and pointing out some of the special features.)

One of the general principles followed in the design is that the high voltage is kept off of all apparatus where it is not absolutely necessary. The main motors, as well as the control apparatus in the main circuits, must of necessity have high voltage on them, but aside from that the only piece of apparatus that has the high voltage applied to it is a little motor driving the motor-generator set, all other auxiliaries being low voltage.

The general scheme of this low voltage auxiliary system is as follows: The motor generator is driven from the 3000 volt trolley. The generator is connected directly to an 85 volt storage battery which floats on the line and absorbs power from the generator when the demand is low and furnishes power to the auxiliary system when the demand is high. It also serves to hold the motor generator to a safe speed by always providing some load for the set.

The main auxiliaries to be supplied are the compressor, blowers for ventilating the motors, boiler blower, control, foot warmers and cab lights besides power for train lights.

Another source of power supply is that of the axle-driven generators, the small generators which look like a street railway motor mounted on four-wheel trucks. These generators are used primarily to supply power for exciting the main motor fields during regeneration. When not regenerating they are automatically arranged, when the locomotive is in motion, to furnish power to the compressor and main blowers. This feature relieves the motor generator-battery set of considerable work and it is therefore reduced in size considerable over what would otherwise be required.

There are five of these locomotives in service on the Chicago, Milwaukee and St. Paul Railway at this time. The first one went into service about the 31st of December and in the next month it had made a mileage of about 6,000. It could do much better than that if trains could be furnished for it. A run of about 226 miles is made in something like $7\frac{1}{2}$ to 8 hours. In case the trains are late when taken hold of by the locomotives, anywhere from 30 minutes to $1\frac{1}{2}$ hours can be made up, which is pretty good considering

that these are not supposed to be high speed locomotives and are run over the mountain grades. They have, however, ample capacity and have shown from their brief performance that they are going to handle the work in the very best possible manner.

If any one has any questions to ask I will be very glad to answer them.

PRESIDENT: We have all been very much interested in this paper and I hope we will have a very full and free discussion. Mr. Berg, Mechanical Engineer, P. & L. E. is present. We would like to hear from him.

MR. KARL BERG: I did not come prepared to discuss the question.

PRESIDENT: How about Mr. Knox of the B. R. & P. Railway.

MR. WM. J. KNOX: I thank you but believe I have nothing to offer.

PRESIDENT: I rather gather from Mr. Storer's remarks that he is living in hope of seeing the day when the Air Brake Company will go out of business. It is possible the Air Brake Company will have something to say about that.

PRESIDENT: We would be glad to hear from Mr. G. W. Wildin.

MR. G. W. WILDIN: While I am closely connected with and interested in the Management of the Westinghouse Air Brake Company, I am not the victim Mr. Storer is shooting at. He is another member of the same family and will have to square his own accounts with Mr. Storer. I am glad, however, that Mr. Storer has not as yet discovered a means of entirely eliminating the air brakes on Electric Locomotives. I presume the only reason he tolerates them is because he cannot coast around yards and terminals, and consequently must have some means of handling the locomotive and trains under these conditions. I note, however, he intimates they are a safety device, should the supposedly better device fail.

Of course I am not able to add anything to Mr. Storer's

remarks about the modern electric locomotive. My last electric experience was about two years ago when on the New Haven road and I have not paid much attention to it since. What I might have to say would be more in a reminiscent way than to attempt to add anything to the author's remarks on the modern construction of the electric locomotive. The electric locomotive shown for the New Haven was the last effort we made in designing an electric locomotive while I was connected with that property. Unfortunately, I did not stay long enough to see what the real result of that amounted to. The New Haven engine was designed for seventy miles an hour speed, which is a much higher speed than the Milwaukee Locomotive was designed for, but, of course, it is a much smaller machine.

I was fortunate enough to be connected with the Management of the New Haven property and go through the entire experimental and development stage of the electrification of that road which service covered a period of eleven years. They began their electrical operation in July, 1908, and I think we experienced failures in about everything that could possibly go wrong with electrification. Mr. Storer will agree with me that if there ever was a nervous bunch it was on the New Haven when we started electric operation. Like everything new, many changes were to be made, but I am sure you would have hard work to get anybody on the New Haven at this time to eliminate electric service and go back to steam operation. They made the mistake of extending electrification of the line too far and not completing and equipping properly that portion from Stanford to Harlem River and Grand Central Station. So there is no real comparison as to economy as between steam and electric operation on the New Haven because they are compelled to maintain two separate organizations, one for steam and one for electric maintenance. They were also poorly equipped in terminals and they did not get the mileage out of the equipment, freight locomotives especially. Their little passenger engines they have are about the finest pieces of machinery the Westinghouse people ever put out. Though they have been changed and altered in many respects and details, they are now hauling 25 percent additional tonnage above their

guaranty rating and making 400, 450 and 500 miles per day, doing it successfully and with greater regularity and less trouble than any steam operation within my knowledge. In switching service, as Mr. Storer says, one electric locomotive is about equivalent to two steam locomotives. A steam locomotive has spells, so to speak, making it less efficient in winter than in summer, which is just the reverse in electric locomotives. The steam engine service depends a great deal on the quality of fuel you have, but the electric is always there. With the electric locomotive you get rid of going to the ash pit for cleaning the fires. If you have an ash pit strike, which you always have in the winter, your electric locomotives come in very nice. Aside from this, it is a fact, however, that an engineer will automatically speed up in operating an electric locomotive. It is more easily reversed, consequently he gets action in the opposite direction quicker.

The freight locomotives on the New Haven have never given the service they should, not because of any weakness in the locomotive, but because their terminal facilities and the matching up of the steam trains with the electric trains at New Haven. All changes had to be made on the main line and with the heavy traffic it was necessary to reduce the tonnage on the electric locomotives to match that of the steam locomotives they had in service. They are now getting better terminal facilities, and, if properly operated, they should overcome all former difficulties. Their mileage per failure on the present freight electric locomotives is about four to one as compared with steam.

The maintenance of electric locomotives is a very simple matter even to a steam organization when they are once familiar with it. It is remarkable to see how easily a steam engineer will get on to the operation of an electric locomotive, and they are preferred piece of machinery to all engineers as they become familiar with the mechanism. If I were on a road where financial conditions would permit, I would not hesitate to electrify if there were heavy grades, large congested terminals, etc. The question of main line electrification on level roads is a question yet to be developed as to whether it is economy or not. If it is a question of

new construction there should be no question in any ones mind.

PRESIDENT: It is with great pleasure that I note the presence of two visitors from abroad, Mr. G. H. Fletcher, Engineer of the Railroad Department of Metropolitan Vickers, and W. M. Williams, Mechanical Engineer of the South African Railroad. I am glad to welcome them and we would like to hear from them on this or any other subject.

MR. G. H. FLETCHER: Mr. Chairman and Gentlemen: This is rather a surprise. I had not intended to address the meeting. I have been especially interested in this subject and in the lecture tonight because we have some propositions in England for which this locomotive or some modification of it would be especially applicable. I think in England we run at rather higher speeds than usually obtain in this country. For instance, in one proposition which we have under consideration at the present time, the maximum speed is 90 miles per hour and the average speed is something like 65. We consider that the best type of locomotive for this work is one with a quill type of drive and we are going forward on this line. In all probability we will put on one locomotive very soon. The voltage is 1500. We have not operated for 3,000 as they have on the Milwaukee but on trunk line electrification we might go to that when that part of the problem has been further worked out. With the proposition about which we have been speaking, it is really trunk line for a distance of about 8 miles with a possible extension of 12.

PRESIDENT: We would be glad to hear also from Mr. Williams.

MR. W. M. WILLIAMS: I hardly feel that I want to speak tonight I am a stranger in a strange land. I am a long way from home. South Africa is my home. I have been very much interested in Mr. Storer's lecture tonight. I have also enjoyed my visit to the Westinghouse works this afternoon.

In South Africa we have something like the hills of Pennsylvania. We have 12,000 miles of line. Incidentally

I am here buying locomotives and cars for our railroad. The country is very mountainous and we have sections 250 miles long where 200 miles are $3\frac{1}{3}$ percent grade compensated, 3 feet 6 inch gauge with 300 feet curves as much as you like to put in. We have one section where there are 27 miles with $\frac{1}{4}$ mile straight, otherwise 300 foot curves.

All I have to say on electrification is this, that they intend to consider the electrification of 1,000 miles of line in South Africa. The General Electric Company are on the job, and I might say there is no reason why the Westinghouse should not get on the job also. I do not understand very much about electricity, although when I went to school I did study a little about it. I have visited the New Haven and the Pennsylvania and I am going to visit the Milwaukee, and I have had facilities for riding on the trains. I have the habit of keeping my mouth shut and my ears open and I hope to gather information in the interest of our administration and to learn a great deal about electrification. In a paper recently received from South Africa it mentions definite parts of the country which are mountainous where they are actually going into the electrification problem as soon as they can.

PRESIDENT: We would be glad to hear from Mr. Van Dusen of the C. M. & St. Paul R. R.

MR. A. B. VAN DUSEN: I told Mr. Storer when he said he would have me called upon that if he did I would "spill the beans." I have been with the Chicago, Milwaukee & St. Paul Railway during the recent main line electrification and for the last year I was on our most recent locomotives with the General Electric Company representatives. If I were to say anything about Mr. Storer's locomotive I would probably mention the bad points. The bad points I imagine maybe the ones you gentlemen would like to hear about. However, it seems that it would be interesting to you, in investigating your own particular problems, if I should point out where it is probable electrification would be advantageous to you. To illustrate this point I should like to point out one or two problems which we ran into and how electrification helped us.

I thought, until the gentleman from South Africa spoke, that we had very severe grades. We have 20 miles of 2 percent grade. That does not sound like much compared with 200 miles of $3\frac{1}{3}$ percent grade. Nevertheless we think we have pretty bad grades. Our railroad is single track. You gentlemen operating in a more dense settled part of the country with two to five tracks are probably out of touch with single track operation. We have single track and we also run through country that is sparsely populated and the train is often a long way from home or help.

As has been said, the locomotive proved most successful in winter. We have two or three weeks of 40 degrees below zero. It is pretty bad with steam power under these conditions. In the winter of 1916 we were just about ready to start electrical operation in December. We had a little trolley over the mountains. We had one locomotive. Then they sent us about three weeks of 40 degrees below zero weather. The steam locomotives were pretty good ones and we had some pretty good men out there, but in spite of everything they froze up all over the line where we could not get to them. The Motive Power Department sent to the electrified section and said, "If it is anything like you say it is, for goodness sake pull these trains. We can't." We only had one engine but it did wonderful work. It started out from Butte and began to collect the dead locomotives. For quite a while it was collecting passenger trains and two or three dead locomotives and hauling them to terminals. One locomotive died on the main line just where we could not get to it by about 500 or 600 feet. We took a piece of train long enough to back down and get hold of that locomotive and haul it out. It kept the line going. One of the greatest features of the Milwaukee electrification is in the winter time you can do anything you want to as far as temperature is concerned. The lower the temperature gets the better the electric locomotive likes it. When it gets cold we increase the rate and the colder it gets the bigger trains we pull.

Of course we kept some kind of statistics and I found we replaced about three steam locomotives with one electric in both freight and passenger service. I am not particularly

acquainted with steam locomotive engineers in your part of the country but in ours they are very fine men. These men out there took hold of the electric locomotives and walked right off with them. Of course before they had been on them all the engine and train crews were against the electrics. There were a thousand and one reasons why they couldn't and wouldn't work. But it took them no time at all to get used to them. It was my particular duty with some of the General Electric men to train the engineers. I did not know as much about the engine as I was supposed to but I was on the job any how. After they found that it was very easy to go up the mountains they would open her up and sit back. You know you do not have to keep up steam or anything else. We got up on top and stopped to try the brakes, then we started down the other side. When we stopped to try the brakes the conductor came up—he was also in the opposition at that time—and he asked if he should go back and turn up the retainers. I told him he could if he wanted to but we did not need them, the regeneration would hold her. There was probably four feet of snow on the siding but nevertheless he went back and turned up the retainers himself, and that was not a very nice job I can tell you. He turned up a few and came back and sat in the cab. We did not have any trouble at all. We went down the hill past the first station. We passed the second station and the men began to grin. We passed the third station and the conductor stuck his head out of the window and looked at the train, and shouted "Charley, come and press the button." When we got to the bottom of the grade he was the most enthusiastic man you ever saw. We went down that 2 percent grade without any application of the brakes.

I remember another engineer who was prejudiced against the electric locomotive. After they had been in service some months I had occasion to ride with him. I asked him what he thought of the electric locomotive. He did not say anything. Finally he says "Look at me." He had a pair of clean overalls on. Then he says "There is no cinder in my eye. We have come 70 or 80 miles. It was seldom we ever went that far that I did not have to help

with the fires. I have been sitting here and having a good time, and here we are." You can't get one of our electric locomotive engineers to go back to steam now.

We had a good many other problems. Before we did electrify one of the best authorities on our road said we must either electrify or build another track. We electrified and handle a good deal more than we did at that time. Though sometimes that does not show up in dollars and cents, the advantages have been very great. And I think with Mr. Williams that all mountain grades, especially where waterpower is available, should be electrified.

PRESIDENT: I think it only fair to Mr. Storer to say that he warned me what would happen. As long as he warned me I did not see that I was taking very much of a chance.

We are very glad to have Mr. Jackson with us and we would like to hear from him.

MR. JOHN PRICE JACKSON: I have been extremely interested in Mr. Storer's talk and particularly struck with the large amount of coal that he says was used in 1916 on the railroads in this country, 142,000,000 tons. And he says probably two-thirds of that can be saved. From the little I saw in Europe it looks as though the time is coming, possibly not in our generation but in the next, when we will be in an even worse state than Europe is now for coal, and if we can save out of that 150,000,000 tons 100,000,000 a year it means leaving a great deal of coal in the ground for our descendants. If on top of that, by these great equipments of power all over the country we can make use of water power, which now we can not economically use, and put in great power plants which will turn out power more economically than we can now do with small plants, we may save 200,000,000. I believe that is one of the important and vital savings in this electrification.

In Europe, and this is a little to one side, I think they have a particular opportunity for electrification on account of their close population. But I happen to think of another thing. I went over the state railroad in France. The railroads in France are very well run in the judgment of a

novice, except L'Etat. We went wandering over the face of France a good deal like going with an ox cart and we got in seven or eight hours after our schedule. That was on the State Railroad in France. From all the study I have had I have an idea that state owned railroads in America might have been a good deal the same as L'Etat in France.

Tonight I want to congratulate Mr. Storer on being one of the scientific and practical engineering men in the development of such a beautiful piece of modern civilization. And I want to congratulate you all that on March 1st you are to have your railroads back again.

PRESIDENT: I take it Mr. Jackson is not exactly an advocate of government ownership. What he says about L'Etat Railroad in France I can endorse most emphatically. Is there any other discussion?

MR. D. J. REDDING: I got in late and did not hear all of the statistics. I would like to know the maximum tractive power of these Milwaukee engines. I heard the statement that one was equal to three steam locomotives. I heard something about 66000 tractive effort; I do not know whether that is maximum or at what speed. Then I noticed that all these gentlemen who seemed interested in electric locomotives hinted that there are conditions under which electric locomotives were not profitable. What are those conditions? Just how does the cost of operation compare on a level railroad with the large steam locomotives we now have?

MR. LYNN: I do not know that I can say anything on the electric part of the question. I was wondering about the power the electric locomotive was going to develop, as to what effect that power might have on the freight cars you are going to haul. The biggest part of my time is taken up trying to keep the cars in condition to haul with steam locomotives and we can only haul up to a certain number. If we are going to double and treble the power we are going to pull the guts out of some of the freight cars.

I have been very much interested in Mr. Storer's paper and I think every one present has profited greatly. I there-

fore move that we extend a rising vote of thanks to Mr. Storer.

The motion prevailed by unanimous vote.

MR. STORER: If I may answer the questions that have been asked, I first want to thank Mr. Williams for the tip he gave us. I presume our sales department is quite wise to the goings on in South Africa and the chances are they will turn up and gobble the business. But we did not want to let him know about it.

As to the maximum tractive effort of these locomotives, I do not know just where he got that story about one being equal to three steam locomotives. The electric locomotives would not be equal to three of some steam locomotives. This locomotive is just what is given you in this little pamphlet which has been sent out. 4200 horsepower on one hour rating with tractive effort of 66,000 pounds. That is not maximum. We can not give the maximum tractive effort that an electric locomotive can develop. As a matter of fact it is limited only by the adhesion of the wheels on the rails. We have 56,000 pounds on each driving axle and there are six of them. If we consider that we can reach $33\frac{1}{3}$ percent adhesion we have a tractive effort of 112,000 pounds and that, the motors can easily develop. We have in tests reached an adhesion above 38 percent with sand on a good rail. In ordinary service I would not expect that to be reached very often. But there is no limit as far as the motors are concerned. It is not like the steam locomotive where it is simply a question of size of cylinder and steam pressure. There the maximum tractive effort is somewhere between 22 and 25 percent. But these have no such limit.

As to the cost of operation on main lines, that is a difficult proposition to answer. We save in fuel very largely, as I have said, somewhere between $\frac{1}{2}$ and $\frac{2}{3}$ and that depends on the different roads. And I may say also that is with roads operated as they are at present or as they will be in a few days. What can be done in the future with steam locomotives I am not prepared to say. I know there are engineers working constantly to improve the operation of steam locomotives and they are doing wonders. But I

believe that at their best we will save one-half the fuel which the steam locomotives would use. But that is only one part of the saving. The amount of labor required on the road will be very much less. It takes a great deal less labor to maintain the ordinary electric locomotive than it does steam. And we save all along the line. The length of the engine division can be doubled and you wipe out that intermediate terminal and you have only half the despatching force required. Economies that can be introduced everywhere are very hard to enumerate. And as I said before there is not a man in the country with vision enough to enumerate all of them.

I can not give figures as to cost of operation on main lines but I think, everything considered, it would pay a good many main lines to install electric operation. It will not pay on all of them and it will not for a good many years to come. But where capacity of the line is limited and it is necessary to increase it or double track, electric operation is going to pay.

As to the effect on freight cars, freight cars have to be made to suit the heavier traffic as far as I can see. The tendency is constantly to increase the length of freight trains and the number of tons in it. I do not know where it will end. I understand some people are figuring on trains of 10,000 tons. There is no reason as far as the electric locomotive is concerned why that is not entirely practicable. I believe the Air Brake Company could handle such a train if they had to. I do not mean to say the air brake is not a necessity on trains. There are cases where it is required in emergency. If somebody pulls the trolley off the regeneration stops. It is necessary to have something to hold your train. The air brake will always be required as far as I can see. But this matter of the length of train is something you must work out for yourselves. It is something that does not concern the electric locomotive. We can pull anything you can put together.

I thank you very much, gentlemen.

There being no further discussion,

ON MOTION, Meeting Adjourned.

J. D. CONWAY Secretary.

**STATEMENT OF THE OWNERSHIP, MANAGEMENT,
CIRCULATION, ETC., REQUIRED BY THE ACT
OF CONGRESS OF AUGUST 24, 1912,**

Of Official Proceedings of Railway Club of Pittsburgh, published nine issues per year at Pittsburgh, Pa., for April, 1920.

State of Pennsylvania, }
County of Allegheny, } ss.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. D. Conway, who, having been duly sworn according to law, deposes and says that he is the Secretary of the Official Proceedings, Railway Club of Pittsburgh, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations:

1. That the names and addresses of the publisher, editor, and business managers are:

Publisher, Official Proceedings, Railway Club of Pittsburgh.

Editor, J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa.

Managing Editor, J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa.

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2. That the owners are:

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J. D. CONWAY, Secretary.

Sworn to and subscribed before me this 9th day of April, 1920.

[Seal.]

SUE B. FRITZ.

(My commission expires February 21, 1923.)

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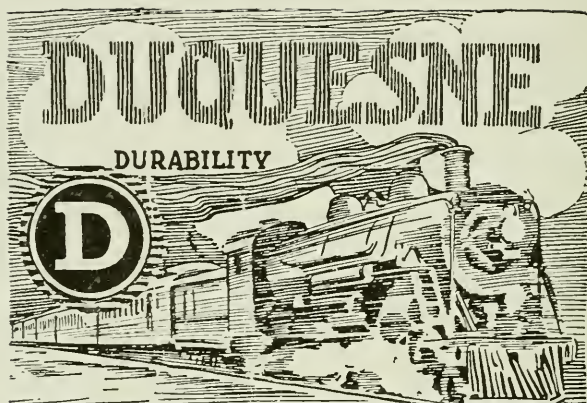
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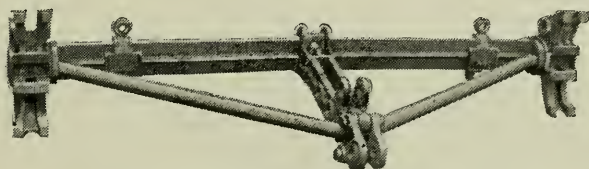
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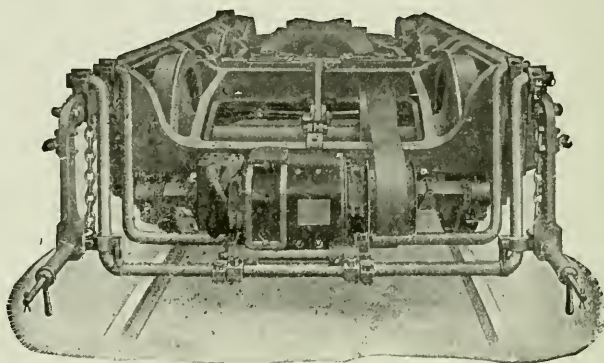
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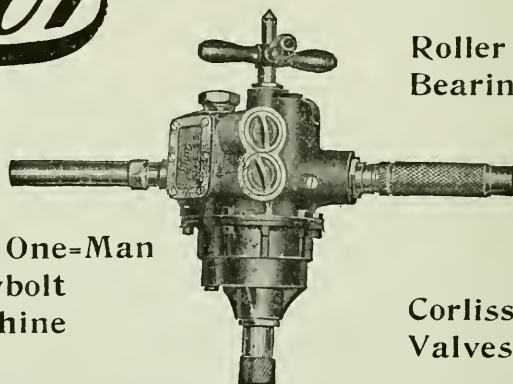
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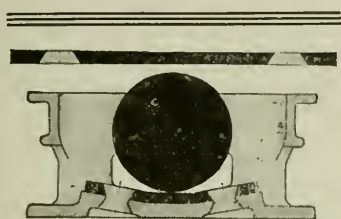
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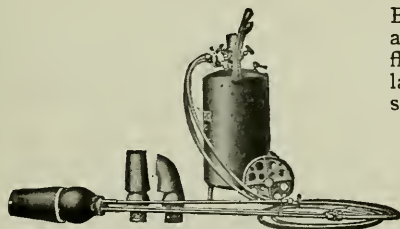
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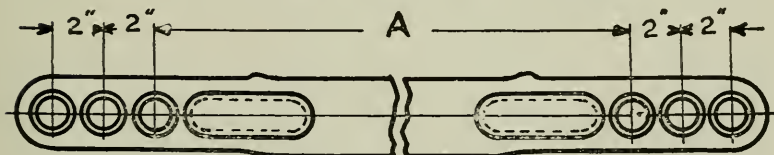
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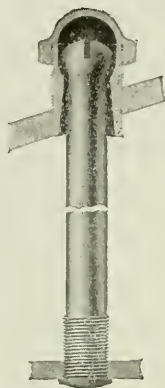


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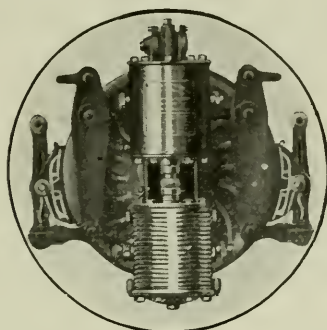
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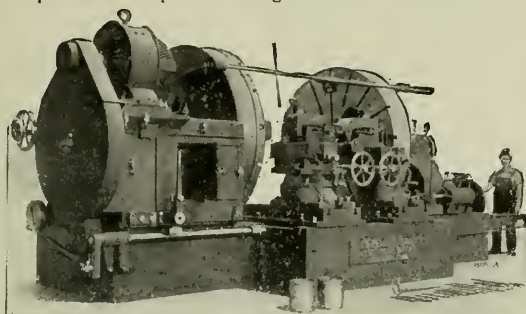
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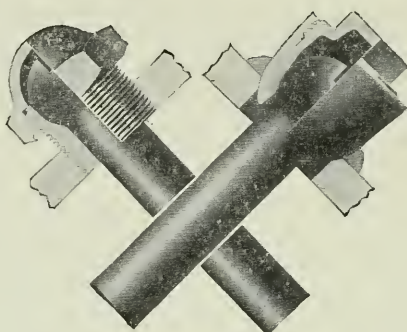
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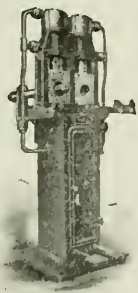
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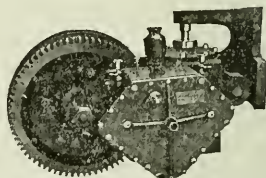


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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of March, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"The Automatic Train Control Problem," by H. S. Balliet, Signal Engineer, Electric Division, New York Central Railroad.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"The Baldwin Locomotive Works" by Arthur S. Goble, St. Louis Representative of The Baldwin Locomotive Works.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"The Labor Situation Today and Tomorrow" by Frank H. Hardin.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"A Few General Observations on Locomotive Valve Motion" by F. Williams, Mechanical Designer, Canadian National Railways, Moncton, N. B.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"The Future of the Railroads" by Samuel O. Dunn, Editor of The Railway Age, New York, N. Y.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—Not received.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"Development of the Steam Locomotive" by E. Converse Peirce, Pittsburgh Manager of the Baldwin Locomotive Works.

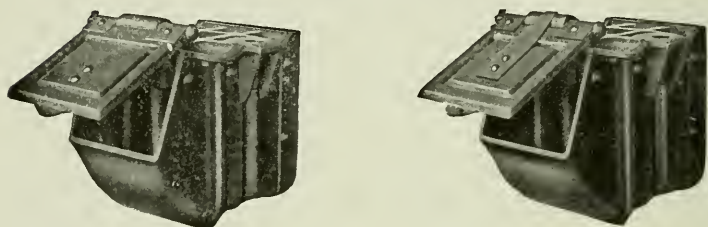
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25c Per Copy

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J. A. SPIELMANN.....	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING,

MARCH 26th, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock P. M., President H. H. Maxfield in the chair.

The following gentlemen registered:

MEMBERS.

Allan, W. J.	Ferguson, T. S.
Allison, John	Finney, H. F.
Amsbary, D. H.	Forney, H. L.
Anderson, A. E.	Forrest, C. H.
Arnold, J. G.	Gregory, Thos. W.
Bacon, John L.	Grieve, Robert E.
Beals, R. E.	Gross, Chas.
Beattie, J. A.	Gummere, W. R.
Bell, R. P.	Gwinn, L. J.
Berg, Karl	Hale, C. E.
Bird, W. Gibson	Harris, J. P.
Bonifield, Chas. P.	Heinemann, W. G. H.
Bowden, T. C.	Howe, D. M.
Briggs, Z. M.	Howe, Harry
Brock, Jesse	Huber, H. G.
Brower, J. E.	Hussong, Albert C.
Burel, W. C.	Jacobs, M. H.
Burke, John F.	Johnson, E. A.
Calvin, A. W.	Johnson, Jno. F.
Chilcoat, H. E.	Jones, David J.
Christley, J. F.	Jungbluth, A.
Church, C. C.	Keagy, C. O.
Clark, Harvey	Kelly, H. B.
Conner, W. P.	King, J. W., Jr.
Conway, J. D.	Lawson, A. F.
Crenner, Jos. A.	Lehr, Harry W.
Crookston, W. G.	Lindstrom, Chas. A.
Cunningham, H. R.	Lobez, P. L.
Daly, P. J.	Long, Edward
Dambach, C. O.	Long, H. P.
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Donaldson, H. R.	Lowe, W. D.
Douglass, W. N.	Lynn, Samuel
Downs, J. J.	Matchett, H. K.
Durant, C. H.	Maxfield, H. H.
Emery, E.	Merscher, Jno.

Millar, C. W.
 Moyer, Oscar G. A.
 McDowell, D. W.
 McFeatters, F. R.
 McGrann, E. Roy
 McKinstry, C. H.
 McMillan, C. M.
 McNulty, F. M.
 Nelson, W. O.
 Nicodemus, E. H.
 Nieman, H. L.
 O'Connor, J. F.
 Patterson, J. E.
 Pearson, A. B.
 Pehrson, A. K.
 Peirce, E. Converse
 Proven, John
 Raser, Geo. B.
 Redding, D. J.
 Regester, Samuel D.
 Rhoads, G. A.
 Ridley, R. C.
 Rowland, W. H.
 Ruben, J. W.
 Ruch, Benj. H.
 Salisbury, S. W.
 Sattley, E. C.
 Schaefer, Frederic
 Searles, E. J.
 Seibert, Wm. L.

Seiss, Wm. C.
 Severn, A. B.
 Smith, Jno. L.
 Snyder, Jos.
 Snyder, J. W.
 Snyder, Rudolph
 Snyder, W. H.
 Speedy, F. E.
 Sponsler, W. L.
 Stark, F. H.
 Straub, W. C.
 Stucki, A.
 Sutter, Chas.
 Teichert, Arno B.
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Renshaw, W. B.	White, A. B., Jr.
Rule, John	Young, John
Salisbury, Geo. H.	Young, L.

The call of the roll was dispensed with, the record of attendance being had through the registration cards.

The reading of the minutes was by unanimous consent dispensed with.

The Secretary read the following list of applications for membership:

Brunton, Arthur John, Gang Foreman, B. & L. E. R. R., Box 167, Unity Station, Pa. Recommended by J. V. Ruhling.

DeLaney, Grover C., Engineer, P. & L. E. R. R., Ohio Ave., Glassport, Pa. Recommended by A. Washburn.

Derflinger, W. E., Engineer, P. & L. E. R. R., 616 Vermont Ave., Glassport, Pa. Recommended by J. F. O'Connor.

Edwards, H. F., R. F. of E., Monongahela R. R., 1025 Lee St., South Brownsville, Pa. Recommended by Joseph Snyder.

Herzog, Henry G., Mechanical Designer, H. K. Porter Co., 249 Oakland Ave., Pittsburgh, Pa. Recommended by Albert W. Calvin.

Hewlett, H. D., Assistant General Foreman, P. & L. E. R. R., 821 Island Ave., McKees Rocks, Pa. Recommended by F. H. Stark.

James, Wm. D., Gang Foreman, P. R. R., 306 Center Ave., Verona, Pa. Recommended by H. W. Innes.

Keller, D. P., Inspector Transportation, P. & W. Va. Railway, Carnegie, Pa. Recommended by C. O. Dambach.

- Key, B. F., Tech. Writer, Westinghouse Air Brake Co., Wilmerding, Pa. Recommended by Alex. England.
- Krebs, Perry E., Clerk, Union R. R., North Bessemer, Pa. Recommended by J. V. Ruhling.
- Lehman, Henry C., Engineer, P. & L. E. R. R., 933 Vermont Ave., Glassport, Pa. Recommended by A. Washburn.
- Manns, J. F., Clerk, Pgh. Ter. R. R. & Coal Co., Wabash Bldg., Pittsburgh, Pa. Recommended by C. O. Dambach.
- Mertz, E. K., Chief Electrician, B. & L. E. R. R., Greenville, Pa. Recommended by W. C. Straub.
- McGeary, E. J., Asst. R. F. of E., B. & L. E. R. R., Greenville, Pa. Recommended by C. O. Dambach.
- McNair, F. W., Yardmaster, B. & L. E. R. R., Russellton, Pa. Recommended by T. C. Bowden.
- Painter, E. W., Yard Clerk, Union R. R. Co., 108 Eighth St., Turtle Creek, Pa. Recommended by R. S. Wilson.
- Palmer, Leon W., Loco. Engr., B. & L. E. R. R., Unity Station, Pa. Recommended by J. V. Ruhling.
- Paugh, Percy, Gen. Foreman, Monon. Ry., 321 Second St., South Brownsville, Pa. Recommended by Jos. Snyder.
- Prouty, Eugene, Mech. Expert, Loco. Stoker Co., 44 Howard St., Bellevue, Pa. Recommended by S. E. Van Vranken.
- Reynolds, D. E., C. C., B. & L. E. R. R. Co., 687 Union Arcade, Pittsburgh, Pa. Recommended by C. O. Dambach.
- Rule, John J., Special Conductor, McKeesport Connecting R. R., 718 Walnut St., McKeesport, Pa. Recommended by J. C. Gorman.
- Stoller, Karl M., Mech. Expert, Locomotive Stoker Co., 214½ Park Ave., Ben Avon, Pa. Recommended by S. E. Van Vranken.
- Thomas, Major J. N., Safety Engineer, Julius King Optical Co., 254 Frick-Annex, Pittsburgh, Pa. Recommended by J. D. Conway.
- Trumbull, A. G., S. M. P., Erie R. R. Co., Youngstown, Ohio. Recommended by M. J. O'Connor.

Walter, W. A., Foreman, P. R. R., 216 Fifth St., Oakmont, Pa. Recommended by W. E. Hornbeck.

Yohe, J. K., Asst. to Gen. Supt. Pgh. & W. Va. Ry., Wabash Bldg., Pittsburgh, Pa. Recommended by C. O. Dambach.

PRESIDENT: As soon as these applications have been approved by the Executive Committee the gentlemen will become members without further action than the payment of one year's dues.

The Secretary announced the death of Mr. James J. Flannery which occurred March 6th, 1920; Mr. Wm. H. Falkenstein which occurred March 2nd, 1920; Mr. George E. Gies which occurred March 20th, 1920; and Mr. J. D. McIlwain which occurred March 5th, 1920.

There being no further business, the paper of the evening was presented by Mr. E. Converse Peirce, Pittsburgh Manager of the Baldwin Locomotive Works, on "The Development of the Locomotive."

DEVELOPMENT OF THE STEAM LOCOMOTIVE.

Mr. President and Members of the
Railway Club of Pittsburgh:

We wish to thank you for this opportunity which you have afforded us of showing moving pictures illustrating the construction of modern locomotives at The Baldwin Locomotive Works.

Before proceeding with the pictures, it may be of interest to make a hasty review of the development of the steam locomotive with which we are so familiar and which we take so much for granted. On account of the short time available we will confine our remarks to the development of the locomotive in this Country, with the exception of the very beginning of the art. It will be impossible for us to mention all of the different types which have been constructed, or to give credit to the different men who have given so much time and thought to the industry.

The steam engine was first used commercially in the early part of the 18th Century, the most advanced type being an atmospheric engine built by Thomas Newcomen

of England. These engines were used principally for pumping water in mines. The machine consisted of a piston which moved in a vertical cylinder closed at the bottom and open at the top, the piston being connected to a walking beam which was located over the cylinder. Steam, barely above atmospheric pressure, was admitted into the cylinder, forcing the piston up. Water was then injected into the cylinder, condensing the steam and drawing the piston down, the work being done on the downward stroke of the piston. These engines acted very slowly as the cylinders were alternately cooled and heated at each stroke. Ordinarily there were about four or five strokes to the minute which permitted the valves being turned by hand at the proper time. Humphrey Potter, however, a young valve tender on one of these engines, wishing to occupy his time in a different manner, connected the valves to the walking beam with cords, thus originating the automatic operation of steam engine valves. By 1780 over 100 Newcomen engines, ranging from 15 to 100 horsepower, were in operation in England.

Such was the steam engine when James Watt, in the latter part of the 18th Century, began his investigations of the properties of steam, which paved the way for its later scientific development. Watt, realizing the waste of steam in the Newcomen engine on account of the alternate cooling and heating of the cylinder walls, constructed a machine on the same principal with the exception that after the cylinder was filled with steam a valve was opened permitting the steam to flow into a separate condensing chamber. Watt also insulated the cylinder with wood and used a steam jacket. Other improvements made by Watt were closing the top of the cylinder, leading the piston rod through a stuffing box, and the use of piston packing lubricated with oil.

While Watt patented a non-condensing engine to be operated by high pressure steam, he did not build such an engine and in fact he seldom used steam over 7 pounds pressure per square inch, as boilers had only been built to stand 10 pounds pressure per square inch.

In 1786, Oliver Evans, an American mechanician, applied to the Pennsylvania State Legislature for a patent for a

high pressure steam engine and although this patent was refused, Evans built a number of high pressure engines for stationary work using steam up to 150 pounds pressure per square inch, which was generated in a pipe shaped boiler as compared with the Cauldron or pot shaped English boiler. In 1803 he constructed, in Philadelphia, a steam dredging machine which also propelled itself on land. In 1819 it is recorded that a disastrous fire destroyed his factory in Pittsburgh, so we can claim Pittsburgh to be the home of the man who not only made the first high pressure steam engine, but also constructed the first machine in the United States that propelled itself on land by means of steam.

While a Frenchman, Nicholas Joseph Cugnot, built a steam carriage in 1769 and Oliver Evans built the dredge in 1803, both of which propelled themselves for short distances on roads, the first steam locomotive to run on rails was built in 1804 by Richard Trevithick, a Cornishman. This locomotive, which was built for a colliery in South Wales, had one high pressure cylinder 8" in diameter by 54" long with the piston connected to a crank on a big fly wheel, the power being transmitted from the fly wheel to two pairs of 52" diameter carrying wheels by spur gears. The steam was generated in a horizontal return tube boiler 60" long. Steam was exhausted into the smoke stack to aid the draft. This engine made a few trips but as it proved destructive to the cast iron plate rails it was soon withdrawn from service. The locomotive ran at a speed of 5 miles per hour and hauled from 10 to 20 tons of iron.

During the next 25 years about 50 locomotives were built in England, many of them being of the so-called "Grasshopper" type. In these engines, pistons in vertical cylinders were connected to walking beams, which in turn transmitted power to auxiliary shafts geared to the carrying wheels, and it was not until 1829 that a locomotive was built with the pistons connected directly to the driving wheels, when George Stevenson built "The Rocket" for the competition held at Rainhill on the Liverpool and Manchester Railway. "The Rocket" had one pair of drivers at the front of the engine and one pair of carrying wheels at the rear of the fire box. The cylinders were placed towards

the rear of the engine at a considerable angle and cross-heads, sliding in guides, were connected by rods to outside crank pins on the driving wheels. It had a horizontal tubular boiler with a forced draft from the exhaust steam. This engine, in a short speed test, ran $29\frac{1}{2}$ miles per hour and 28 miles per hour with a car and 36 passengers. To Stevenson belongs the credit for building the first locomotive of simple construction and of making a success of the idea of running an engine on rails which was started by Trevithick.

It was about this time that people in America began to give their attention to the question of railroads and by 1830 a few locomotives of the complicated "Grasshopper" type had been imported from England.

The first locomotive constructed in the United States for regular service was built in 1830 for the Charleston and Hamburg Railroad in South Carolina. This locomotive had two inclined cylinders 6" x 16" connected inside to the front pair of drivers by a crank axle. The drivers were connected to a second pair of wheels, both about 54" in diameter, by outside side rods. Steam was generated in a vertical boiler. The engine weighed about 10,000 pounds and with 50 pounds working pressure had a tractive power of about 400 pounds. It is reported to have hauled 40 or 50 passengers on 4 or 5 cars at the rate of 16 to 21 miles per hour and that it ran 35 miles per hour without load. This locomotive ran until June 1831 when the boiler exploded on account of the negro fireman holding down the safety valve. We quote from a letter written by the engineer as given in Mr. W. H. Brown's book entitled "First Locomotives in America," as follows:

"This negro (referring to the fireman) was annoyed at the noise occasioned by the blowing off of the steam and fastened the valve lever down and sat upon it, which caused the explosion, badly injuring him, from the effects of which he died afterward, and scalding me."

and from the same book we quote from an account given in the Charleston Courier of August 1st, 1831, describing the trial of the next locomotive on this road, as follows:

"The new locomotive worked admirably and the

safety valve being out of reach of any person but the engineer will contribute to the prevention of accidents in future such as befell the first one."

In this connection we might add that the railroad advertised that a barrier car loaded with bales of cotton would be placed between the locomotive and the passenger cars so as to prevent injury to the passengers in case of explosion.

In 1832 a four wheeled engine, weighing a little over five tons was constructed with a pair of driving wheels 54" in diameter on a crank axle placed in front of the fire box and a pair of carrying wheels 45" in diameter under the smoke box. Horizontal inside connected cylinders $9\frac{1}{2}" \times 18"$ were placed at the front of the engine. The frame was of wood placed outside the wheels. The steam was generated in a 30" horizontal boiler having 31 copper tubes $1\frac{1}{2}" \times 7'$ long. The engine was reversed by connecting the eccentric rods with the upper or lower arm of rock-shafts.

From this locomotive was developed a type of engine having one pair of driving wheels and a four wheeled truck placed under the smoke box. The driving wheels were placed at the front or the rear of the fire box, different builders claiming advantages for the two locations. With the driving wheels in the forward position greater adhesion was obtained but with the drivers back of the fire box the engines ran more evenly and were easier on the tracks.

By 1840 this six wheeled type of engine was being built by one of the builders in three sizes, having cylinders $10\frac{1}{2}" \times 16"$, $12" \times 16"$, $12\frac{1}{2}" \times 16"$ and weighing 20,000, 23,000 and 26,000 pounds respectively. About half the weight was on the drivers, which were generally 54" in diameter.

At the same time, other builders were developing the "Grasshopper" type of engine with vertical cylinders and boilers, the earlier sizes weighing about 8,000 pounds. A later engine of this type had vertical cylinders $10" \times 12"$ connected by a beam to an auxiliary shaft which was geared to 30" driving wheels. Steam of 50 pounds pressure was generated in a tubular boiler. The weight was about 14,500 pounds.

From the "Grasshopper" type of engine was developed the "Crabs." These engines had vertical boilers and horizontal cylinders with crossheads sliding in guides connected by rods to an auxiliary shaft, which in turn was geared to the driving wheels. The "Grasshopper" and "Crab" engines had a short wheel base and were used on curves as sharp as 60' radius.

The first engine of the well known American type was built in 1837. There were no equalizing beams, there being a separate spring over each driving box. During that year the second American type locomotive was built with the driving axles running in a separate square frame connected to the main frame by a single bearing on each side. This engine had cylinders 12" x 18", driving wheels 44" in diameter, weight on drivers 16,000 pounds, total 24,000 pounds. The first equalizing beams ever used were applied to an American type locomotive built shortly afterwards.

In 1838 a United States Government report of locomotives in service showed 271 built by American manufacturers and 74 by 10 foreign manufacturers.

Some of the improvements made in the period from 1830 to 1840 were wrought iron bar frames with pedestals forged in one piece, ground steam joints, metallic packing, consisting of wire and the making of parts to gauges and templates, giving interchangeability of parts on locomotives of the same design.

In the period from 1840 to 1850 the locomotive builders brought out various types of six coupled and eight coupled freight engines to take care of the heavier loads and increasing traffic on the railroads. One type of both six and eight wheeled engines having all wheels coupled, had the two front pairs of drivers connected in a flexible truck which permitted one pair to move to the right when the other moved to the left. The rear wheels were placed rigidly in the frames. The side rods were made with cylindrical brasses. This arrangement gave a very flexible engine which proved quite popular. The six wheeled engines varied in weight from 12 to 17 tons and the eight wheeled from 18 to 27 tons. Cylinders were used as large as 17" x 22". The

drivers in most cases were 42" in diameter and ran up to 48" in diameter.

Another type of eight wheeled engines developed in this decade was known as the "Mud Digger" and was developed from the "Crabs." These engines had horizontal cylinders at the front of the engine, most of them 17" x 24", connected to an auxiliary shaft back of the fire box above the rear drivers. This auxiliary shaft was geared to the back driving axle and the four pairs of wheels, usually 33" in diameter, were connected outside the frame by cranks and side rods.

For passenger service the American type of engine was the most popular, the weight of these engines running from about 12 to 19 tons. In 1847 the first Ten Wheeler was developed from the American type by adding a third pair of driving wheels. Cylinders 14½" x 22" and driving wheels 46" in diameter were used and the total weight in working order was approximately 44,000 pounds.

During this period a number of the so-called Crampton engines were built for high speed passenger service. One of these engines had horizontal cylinders 13" x 34" placed at the front of the engine and connected to one pair of drivers 8' 0" in diameter placed at the rear of the boiler. The front end of the boiler was supported by a six wheeled truck. While a speed of over 60 miles per hour was obtained with engines of this type, this was unnecessary as the average speed required was only about 30 miles per hour, and the idea was soon given up on account of the low adhesion which could be obtained from one pair of wheels, although several devices were tried for increasing the weight on drivers.

Wagon top boilers and iron flues were first used between 1840 and 1850 but the biggest improvement was the introduction of the Stephenson link motion with the variable cut-off.

During the next 15 years, from 1850 to 1865, builders began to give their attention to increasing the size of the boilers and fireboxes. The first locomotive with the firebox on top of the frames was built in 1857 but before this was done a number of engines were built with wide overhanging

fireboxes placed back of the driving wheels, the frames only running up to the front of the firebox and the draft rigging being attached to the boiler. In later engines of this type drawbars, running through the ash pan, were connected directly to the frames. Most of these engines had 4 pairs of coupled driving wheels, one engine, however, having 4 pairs of driving wheels and a 4 wheeled leading truck, locomotives with this wheel arrangement later being called the "Mastodon" type. From the wide firebox placed back of the driving wheels and the firebox on top of the frames was developed, in 1877, the Wooten boiler having a wide firebox placed over the wheels.

Experiments were also made to improve the combustion by placing deflecting plates in the firebox. As the plates burned out very rapidly a brick arch supported on plugs in the side sheet was tried and in 1858 the first locomotive was built with a fire brick arch placed on tubes.

Steel plates for fire boxes were first tried in the early 60's and proving very satisfactory were almost universally used by 1866. Two years later boilers were being built with all the plates of steel and also with steel tubes. In 1870 steel driving tires for the first time were shrunk on without the use of bolts or rivets in any form.

The great majority of engines built between 1850 and 1865 were of the American and Ten Wheel type, the former having cylinders up to 15" and 16" diameter, and the latter up to 17" and 18" diameter.

During the following three years three new types of locomotives were developed; in 1866 the Consolidation, the first engine of this type having cylinders 20" x 24", driving wheels 48" diameter, and weighing in working order on drivers 80,000 pounds, total 90,000 pounds; in 1867 the Mogul, and in 1868 a locomotive having 5 pairs of driving wheels 44" diameter, cylinders 20" x 24", working pressure 150 pounds and weighing in working order 112,000 pounds.

In 1869 a locomotive was first equipped with an air brake, the invention of which has made possible the increase of railrad equipment to its present size and weight.

From 1870 to 1880 there was a further increase in the size of locomotives but we do not find any new types.

In 1880 a high speed passenger engine, capable of running 60 miles per hour, was built to burn anthracite coal. This locomotive is interesting in that it was equipped with a pair of 45" trailers equalized with a single pair of drivers 18" in diameter, there being space back of the driving wheels for a large fire box 8' 0" long and 7' 0" wide, such as is required for anthracite coal. This locomotive, with a pair of wheels placed under the firebox was the forerunner of the various types of locomotives with trailing wheels which have proven so popular during the last 20 years.

From 1880 to the end of the 19th Century there was a constant increase in the size of the existing types of locomotives and in addition three new designs were introduced, in 1885 the Decapod, having a 2 wheel forward truck and 5 pairs of driving wheels; in 1893 the Columbia type, having a 2 wheeled front truck, 2 pairs of drivers and a 2 wheeled rear truck under the firebox, and in 1895 the well known Atlantic type, which is the same as the Columbia except that the front truck has two pairs of wheels.

In 1887 a big advance was made in the construction of boilers. During that year a locomotive was built with a long wagon top boiler, the wagon top extending far enough ahead of the firebox crown sheet to allow the dome to be placed in front of the firebox. The crown sheet of this boiler was supported with radial stays.

In 1888 the automatic coupler was introduced and in a very short time all of the locomotives built were equipped with this device.

The first compound locomotive was constructed in 1889 and a large number of locomotives of this type were built during the next 15 years.

By 1900 passenger engines of the American and Atlantic types were being built with driving axle loads of 44,000 pounds and freight engines of the Mogul, 10 wheel, Consolidation and Decapod types were being built with driving axle loads of 34,000 to 36,000 pounds. Most of the engines were built with a 180 pound working pressure, although a pressure of 200 pounds was occasionally used.

Since 1900 we have seen the introduction of the Prairie, Mikado, Santa Fe, Pacific and Mountain type locomotives.

which were developed from the Mogul, Consolidation, Decapod, Ten Wheeler and Mastodon types respectively by the addition of a pair of trailing wheels.

In 1904 the first Mallet Articulated Compound locomotive was built having 6 pairs of drivers and weighing in working order 334,500 pounds. Since that date about a thousand Mallets have been built with various wheel arrangements, the largest having 2 wheel trucks at the front and rear and 2 sets of 5 pairs of driving wheels, and weighing in working order 684,000 pounds exclusive of tender.

In 1905 outside valve motion was introduced on a number of railroads in this Country and a year later we find the first use of superheaters, both of which devices became standard equipment within a few years.

The first locomotive of the Triplex type, a development from the Mallet and having a third pair of cylinders on the tender, was built in 1913. This locomotive has a tractive power of 160,000 pounds working compound and weighs on drivers 161,600 pounds total.

During the past few years driving axle loads of over 60,000 pounds have become quite common and in several instances the load has been over 70,000 pounds. Working steam pressures have been increased up to 240 pounds per square inch, the most commonly used being 200 pounds. Tractive powers of over 80,000 pounds have been obtained from single expansion engines and of 147,200 pounds and 116,600 pounds from a Mallet locomotive when working compound and single expansion respectively.

To give a general idea of the increase in the number of steam locomotives from year to year, we have prepared the following diagram from Government and Builders' records. In addition to the number of locomotives in use on the railroads, we have indicated the number equipped with air brake and automatic couplers, showing the very rapid adoption of these devices.



Mr. Peirce then proceeded with the moving pictures, illustrating the construction of modern steam locomotives.

PRESIDENT: I am sure we have all been very much interested, as well as instructed, by the paper which has been presented tonight and the illustrations shown on the screen. Perhaps it would be somewhat difficult to discuss this paper as it is so largely historical in its purpose but I am sure Mr. Peirce will be glad to answer any questions which you may desire to ask him and no doubt some of the older members may be able to give us some reminiscences of the earlier days of railroading which would be apropos to a paper of this sort.

MR. D. J. REDDING: What astounded me most in that performance was the speed with which these fellows worked. I am quite sure they were not working at the government rate of 12 cents an hour when they did that work. If we could get the prescription the Baldwin people use we would not be complaining about the shortage of help. Possibly it is the fault of the projecting machine.

One noticeable thing about this paper is that starting away back in the early days with almost the first locomotive, some fellow whom we do not remember developed the idea of the reciprocating engine and finally it was applied to the locomotive, and we have the same locomotive today. There has not been much improvement made on the locomotive in principle. It is in the details that it has advanced in our time, the appliances that have been put on. We are still operating reciprocating engines with considerable waste, due to the fact that we use the steam a short distance and then exhaust it, and then there is more or less dead time until another impulse takes place. That has continued for a hundred years or so. Perhaps in the next hundred years, somebody will find a way to give us the continuous turning effort of the steam. Then those of us young fellows who are still living will look back with considerable chagrin at the time when we wasted all that energy, losing the steam without having full turning effort.

It is an interesting set of pictures from a historical standpoint, and it does show the wonderful effects of concentration, proper planning of the details and proper applica-

tion of the drawing room methods, when they can construct all the different parts of a locomotive and put them together in such a haphazard way and have them stick. But I really feel that while we know they did not move quite as fast as the pictures indicated, a study of the methods by which they design those parts and build them in a vast manufacturing plant and bring them together and have them fit, would be very valuable to many railroad shops.

MR. A. STUCKI: As I understand Mr. Redding, he wants to apply the principle of rotary engines to the steam locomotive instead of using the reciprocating engines. This change has been made in stationary engine practice with most astounding results by the use of steam turbines and I also know of several designs of rotary gas engines more or less successful.

I would like to know whether that gasoline engine mentioned by Mr. Peirce was an internal combustion engine, hence reciprocating, or whether it was based on other principles.

MR. PEIRCE: The gasoline locomotive illustrated in the pictures is propelled by an internal combustion engine, which can be equipped for use of kerosene, distillate or alcohol, as well as gasoline.

The driving mechanism is similar to that of an automobile, there being a multiple disc clutch and a transmission with machined gears, giving four speeds both forward and reverse. A jack shaft in the transmission, with cranks set at ninety degrees, is connected to the driving wheels by two rods.

The locomotives are built in five sizes; the three smaller ones weighing 5, $7\frac{1}{2}$ and 10 tons, have four cylinder engines and four driving wheels, while the two larger ones, weighing 15 and 25 tons, have six cylinder engines and six driving wheels.

PRESIDENT: Mr. Lindstrom seems to be thinking pretty hard. Can we hear from him?

MR. CHARLES A. LINDSTROM: I really do not know that I have anything to say that may be of interest.

except that I have enjoyed the pictures very much. However, they remind me of the time I was connected with the Pennsylvania Railroad, when we assembled a Locomotive, in the Altoona Shops, in three hours, counting from the time the frame was placed in the erecting shop, to receive the boiler, wheels and other equipment, until the engine was ready for steam. This was done merely as a test as to what could be done, and not with the idea of making it a regular practice. To assemble a Locomotive in three hours, was, at that time, believed to be a record performance, but judging from the pictures we have seen tonight, they do it now in less time.

About 12 years ago, on a trip through Europe, I visited the Ganz-Tarsa Works, at Budapest. They employed, at that time, about 4,000 men, and manufactured Electrical Machinery and Cars, both Passenger and Freight.

The General Superintendent of the plant took me around, showed everything they had, and was very proud of his equipment. When we came to the Freight Car Shops, he pointed out a four wheel Composite Gondola Car, of about 12 tons capacity, which had just been finished, and said: "We build ten of these every day, one every hour," and then repeated, holding up one finger, "one every hour." To which I replied: "Wunder Shoen," which may be translated into "Remarkable," which pleased him very much. If I had told him we build at the rate of 100—50 ton Steel Cars in each of our three shops every day, or 10 to 12 every hour, he would have thought me a liar, so what was the use of spoiling the favorable impression, which I believed I had made.

To illustrate the great advance that has been made in the size of Locomotives, it may interest you to know, that when the Pennsylvania Railroad built the Juniata Shops at Altoona, in 1889, everything in those shops was built to handle the Class R Locomotives, which weighed about 170,000 pounds, as they were thought by Mr. T. N. Ely, then General Superintendent of Motive Power, to be the heaviest Locomotives that would ever be built, but it was not many years before practically the entire equipment of Cranes, etc., in those shops, had to be changed to handle

the modern Engines. At the present time, we have Steam Locomotives weighing over 300,000 pounds, and Electric Locomotives weighing over 500,000 pounds.

I met in Philadelphia, a number of years ago, an old Locomotive Engineer, who said he was, at one time connected with the Pennsylvania Railroad, and remarked that they thought at that time that the Locomotives then in use, could not be improved upon, but look at the engines now, he said, they are wonderful.

There has certainly been great strides forward, not perhaps as much in novelty of general designs, as in weight and originality in conceptions of details. Mr. Stucki referred to rotary engines for Locomotives. This question has been considered for a number of years, but I do not believe that a successful construction has been worked out so far; there is not sufficient room for the necessary power, and I am afraid we will have to stick to the reciprocating type of engine, for some time yet.

In concluding, I wish to say that the pictures were very instructive, especially to those who are not intimately acquainted with Shop methods, and I hope we may be entertained with similar papers in the future.

PRESIDENT: We would like to hear from Mr. Howe. He might tell us how the paint was put on.

MR. D. M. HOWE: All I could say is that I heard Mr. Redding and Mr. Lindstrom use that word "reciprocating." It reminds me of one time when we met down at the hotel when six or eight of the older members met in the liquidating department. Some fellow would say we will take a drink. Then the next fellow would begin to reciprocate. And then they would reciprocate some more. And after they had had seven or eight reciprocations they would go back to the beginning and start it all over. I think some of the men here will understand what I am trying to say. However, what I don't know about locomotives, except in this matter of reciprocating, would fill a large book, so I will not attempt to talk about the locomotive.

MR. D. J. REDDING: Think what would have hap-

pened if they had had a rotary instead of a reciprocating type!

PRESIDENT: I think that calls for a reply from Mr. McFeatters.

MR. F. R. McFEATTERS: I do not think there should be any reliance placed on what Mr. Howe says.

MR. REDDING: I should like to have our President tell us something about whether they had any trouble setting up those big guns and locomotives that we saw on the screen after they got them over to France. Did they go together as quickly and as easily as they did on the screen? I understand Col. Maxfield had charge of setting up those big guns.

PRESIDENT MAXFIELD: I do not think I better talk much. We did not have charge of the operation of putting up those guns. We helped put them up and they went together pretty well. As I recall it, we put up about 1500 of those locomotives—not the kind you saw on the screen—and after we got them about all completed we began to count up and found that two could not be connected because of missing parts. So we had to scurry around and find a part here and a part there and when I began to investigate they told me the reason they could not put two of them together was because they had to use the parts of those to fix up the other locomotives. But take it all in all, that was a pretty good percentage.

It is only fair to the speaker, however, to say that the locomotives went together in pretty good shape. Of course there was a good deal of trouble in locating some of the parts. Perhaps you do not know it but there was a very great deal of confusion at the ports in this country and also in France, due to the immense amount of material which was lying on the docks at all times for shipment. The ports on this side of course wanted to get the stuff off the docks, so they piled it on the ships, and it did not make much difference to them whether the boilers of one locomotive and the wheels of another or half of one and half of another went on a boat so long as they filled the ships and got

them started off for the other side. Unfortunately some of the parts went astray and that is the reason we had such a hard time erecting the last two locomotives.

Is there any further discussion? If not, does Mr. Peirce wish to add anything in reply to what has been said? If not, I wish to express to Mr. Peirce on behalf of the Club our sincere thanks for presenting this paper.

There being no further discussion the meeting upon motion adjourned.

J. D. CONWAY, Secretary.

In Memoriam

WM. H. FALKENSTEIN.
Died, March 2nd, 1920.

J. D. McILWAIN,
Died, March 5th, 1920

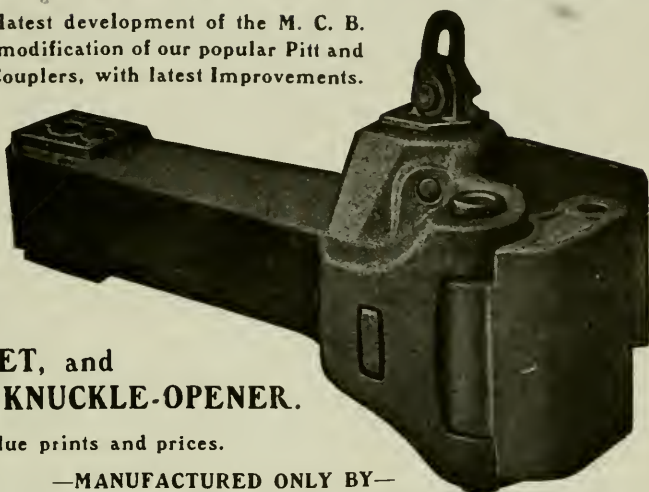
JAMES J. FLANNERY,
Died, March 6th, 1920.

GEORGE E. GIES,
Died March 20th, 1920.

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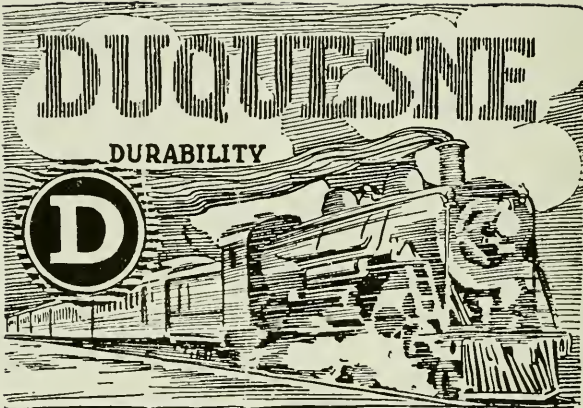
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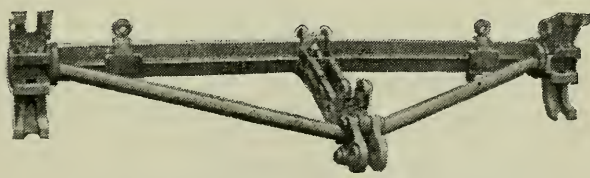
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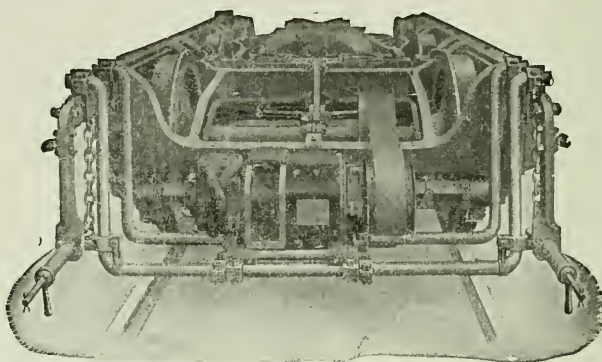
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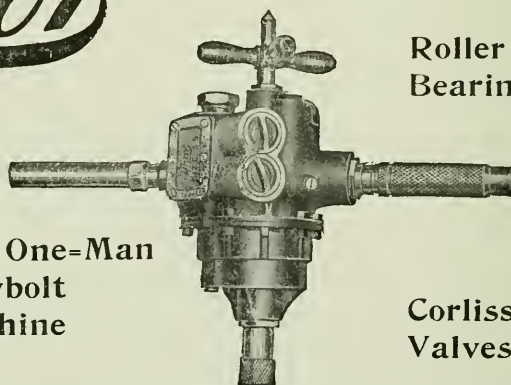
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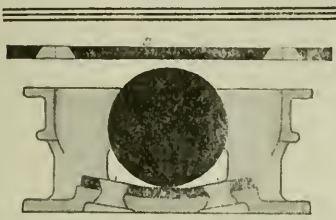
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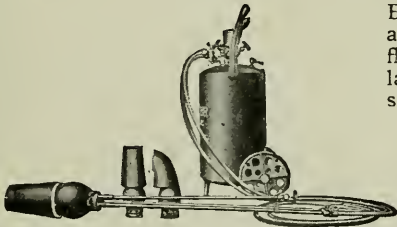
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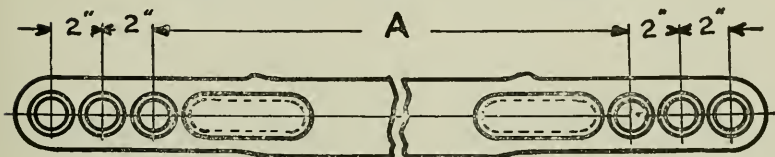
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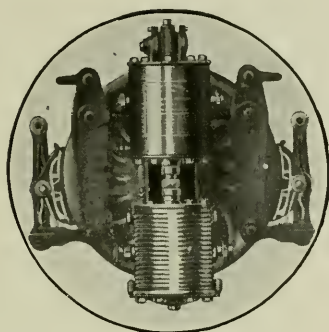
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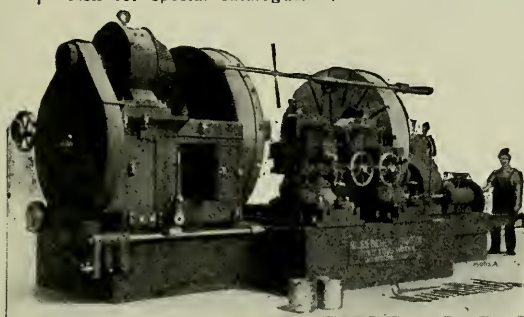
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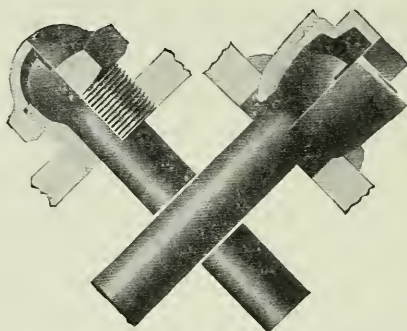
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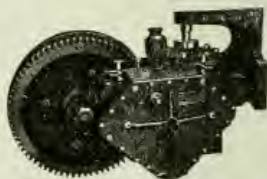
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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of April, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"How to Increase the Efficiency and Operating Capacity of Steam Locomotives" by B. B. Milner, Engineer of Motive Power and Rolling Stock, New York Central Railroad.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railway Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"The Bituminous Coal Industry and the Public" by Eugene McAuliffe, President and General Manager, Union Colliery Co., St. Louis, Mo.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Not received.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"Freight Car Roofs" by H. R. Naylor, Assistant Works Manager, Car Dept., Canadian Pacific Railway, Angus Shops, Montreal.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"The Chemistry of Railroadings" by Chas. Browning, Jr., Assistant to Engineer of Tests, Southern Pacific Railroad Co.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—Not received.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"Coal Mining and Transportation" by J. W. Paul, Chief Coal Mining Engineer, Bureau of Mines, Pittsburgh, Pa.

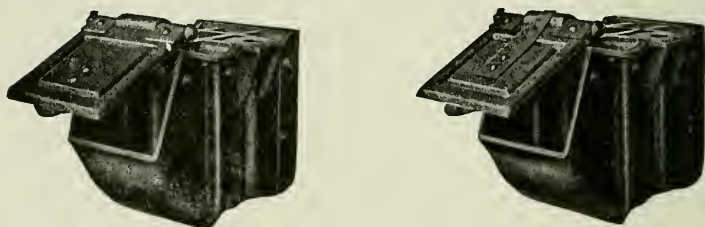
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J. A. SPIELMANN.....	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING

APRIL, 22, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock P. M., Vice President, Mr. Frank J. Lanahan in the chair.

The following gentlemen registered:

MEMBERS

Adam, Lewis	Innes, H. W.
Allan, W. J.	James, W. D.
Anderson, A. E.	Keller, D. P.
Arnold, J. G.	Keptner, J. B.
Babcock, F. H.	King, J. W., Jr.
Batty, John	Knox, Wm. J.
Bonifield, C. P.	Lanahan, Frank J.
Bowden, T. C.	Laughner, C. L.
Bowler, R. T. E.	Lent, John F.
Bradley, W. C.	Lindstrom, Charles A.
Brann, W. S.	Lobez, P. L.
Burel, W. C.	Lynn, Samuel
Calvin, A. W.	Manns, J. F.
Charlton, W.	Matchett, H. K.
Christy, F. X.	Millar, C. W.
Clark, C. C.	Mills, C. C.
Code, J. G.	Myers, W. H.
Conway, J. D.	McKee, Frederick C.
Cromlish, Wm. L.	McNulty, F. M.
Cunningham, H. R.	Orchard, Chas.
Cunningham, R. I.	Painter, Joseph
Dambach, C. O.	Proft, J. W.
De Vilbiss, E. B.	Prouty, E.
Durant, C. H.	Proven, John
Emery, E.	Ridley, R. C.
Fink, P. J.	Roth, Philipp J.
Forrest, C. H.	Ruben, J. W.
Freshwater, F. H.	Ruhling, J. V.
Gaw, F. W.	Rush, Benj. H.
Gilg, Henry F.	Sattley, E. C.
Glaseman, W. J.	Severn, A. B.
Gross, C. H.	Sewell, H. B.
Harris, J. P.	Snyder, Jos.
Herzog, Henry G.	Snyder, W. H.
Howe, D. M.	Speedy, F. E.
Hyndman, H. R.	Stark, F. H.

Streib, J. F.
 Stucki, A.
 Sutter, Chas.
 Thomas, Maj. J. N.
 Townsend, J. Fred
 Van Vranken, S. E.

Vowinkel, F. F.
 Warne, J. C.
 Welty, C. L.
 West, John W.
 Winell, K. O.
 Wright, John B.

VISITORS

Berrie, J. J.
 Boyd, Chas. C.
 Carlsson, John
 Church, C. S.
 Colbert, Chas. F., Jr.
 Forbes, T. E.
 Holbrook, E. A.
 Jenkins, E. M.
 Kroske, J. F.
 Leland, C. Ralph
 Manns, G. A.
 Moir, Wm. B.
 Monks, Geo. S.
 Morris, J. H.

Murphy, C. C.
 Nelson, W. M.
 Paff, John L.
 Paul, J. W.
 Pennington, F. W.
 Potter, S. J.
 Schmid, Wm. L.
 Sneck, H.
 Stahlman, M. C.
 Stillings, William
 Thomas, J. A.
 Wanuch, C.
 Ward, F. T.
 Ward, Wm. J.

Williams, R. J.

The call of the roll was dispensed with, the record of attendance being had through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Balton, N. L., Foreman, B. & O. R. R., 19 Mansion Street, Hazelwood, Pittsburgh, Pa. Recommended by W. C. Burel.

Berrie, J. J., Foreman, B. & O. R. R., 129 Hackston Street, S. S., Pittsburgh, Pa. Recommended by C. L. Welty.

Bloom, H. C., Engineer, B. R. & P. R. R., Box 474, DuBois, Pa. Recommended by A. B. White.

Braund, Jos., G. C. F., B. R. & P. R. R., 218 N. Penn Street, Punxsutawney, Pa. Recommended by A. B. White.

Carley, W. J., Salesman, H. E. McCoy Co., 419 House Bldg., Pittsburgh, Pa. Recommended by J. D. Conway.

- Cope, E. E., M. M., B. R. & P. R. R., DuBois, Pa. Recommended by A. B. White.
- Criswell, Harry B., Inspector, B. & O. R. R., 414 Bailey Avenue, Pittsburgh, Pa. Recommended by W. C. Burel.
- Eagan, J. T., R. F. of E., B. R. & P. R. R., 208 W. Scribner Avenue, DuBois, Pa. Recommended by A. B. White.
- Forbes, T. E., Salesman, Ingersoll Rand Co., 706 Chamber of Commerce Building, Pittsburgh, Pa. Recommended by F. W. Gaw.
- Hall, D. D., Engineer, B. R. & P. R. R., 5 Olive Avenue, DuBois, Pa. Recommended by A. B. White.
- Harris, George F., Chief Car Distributor, B. R. & P. R. R., DuBois, Pa. Recommended by A. B. White.
- Hillis, William R., Conductor, B. R. & P. R. R., Punxsutawney, Pa. Recommended by A. B. White.
- Johnson, George W., Terminal Supt., B. R. & P. R. R., 516 Sheridan Avenue, New Castle, Pa. Recommended by A. B. White.
- Jones, Robert, Engineer, B. R. & P. R. R., Butler, Pa. Recommended by A. B. White.
- Jordan, J. M., Mechanical Expert, Loco Stoker Co., 202 South Jefferson Street, Punxsutawney, Pa. Recommended by R. M. Long.
- Kroske, J. F., Salesman, Ingersoll Rand Co., 706 Chamber of Commerce Building, Pittsburgh, Pa. Recommended by F. W. Gaw.
- Moore, R. L., Assistant Supt., B. R. & P. R. R., 501 East Mahoning Street, Punxsutawney, Pa. Recommended by A. B. White.
- Pfeil, John M., Sales Engineer, Westinghouse Electric and Manufacturing Co., Union Bank Building, Pittsburgh, Pa. Recommended by H. C. Mode.
- Potter, S. J., Foreman, B. & O. R. R., 5609 Gatelodge Street, Pittsburgh, Pa. Recommended by W. C. Burel.
- Reid, J. J., Conductor, B. R. & P. R. R., 110 E. Weber Ave-

- nue, DuBois, Pa. Recommended by A. B. White.
- Silverolli, C., Foreman, B. & O. R. R., 5504 Sunnyside Street, Pittsburgh, Pa. Recommended by W. C. Burel.
- Tate, R. G., G. Y. M., B. R. & P. R. R., 911 E. Mahoning Street, Punxsutawney, Pa. Recommended by A. B. White.
- Troan, William, Conductor, B. R. & P. R. R., 224 Morrison Street, DuBois, Pa. Recommended by A. B. White.
- Ward, F. T., Inspector, B. & O. R. R., 837 Flemington Street, Pittsburgh, Pa. Recommended by W. C. Burel.
- Ward, Wm. J., Inspector, B. & O. R. R., 236 Trowbridge Street, Pittsburgh, Pa. Recommended by W. C. Burel.
- Woodbridge, H. C., Representative, Loco. Stoker Co., 245 Rugby Avenue, Rochester, N. Y. Recommended by S. E. VanVranken.

VICE PRESIDENT: As soon as these applications have been approved by the Executive Committee the gentlemen will become members upon payment of the year's dues.

Announcement was made of the death of one of our Honorary members, Dr. John A. Brashear, which occurred April 9th, 1920, and also of Mr. A. B. Bellows of the Pittsburgh Testing Laboratories which occurred April 17th, 1920. The Vice President directed that memorial minutes be inserted in the Proceedings.

There being no further business, the paper of the evening was presented by Mr. J. W. Paul, Chief Coal Mining Engineer of the Bureau of Mines who was introduced by the Vice President.

THE STORY OF COAL AND TRANSPORTATION OF COAL.

By MR. J. W. PAUL.

Mr. J. W. Paul--Mr. Chairman and Members of the
Railway Club of Pittsburgh:

The officers of your club through the entertainment committee recently requested the Bureau of Mines to present some feature of its activities as a part of the entertainment for your meeting tonight, and in response, the Bureau has selected "The Story of Coal" and "Transportation of Coal," as the subjects to be presented in moving pictures.

While your program calls for a paper to be presented by myself tonight, I have come prepared only to informally talk regarding the pictures that appear on the screen.

The Federal Bureau of Mines, under its organic Act of Congress, is authorized to conduct investigations and disseminate information relating to mining and metallurgical industries for the purpose of improving methods, conserving the nation's natural resources and the conservation of the lives of the many engaged in these industries.

The principal testing station of the Bureau of Mines, as all of you know, is located in Pittsburgh, and has been installed, including grounds, buildings and equipment, at an outlay of approximately a million dollars, giving employment to about 200 persons who are specialists in their particular work.

The results of the technical investigations conducted by the Bureau are published by the Government in the form of Bulletins, Technical Papers and Miners' circulars, and may be secured by any person interested by a request addressed to the Director of the Bureau at Washington.

There is a large number of people in the Mining and Metallurgical industries and still a larger number in other industries who do not trouble themselves to secure the publications.

The Bureau has recognized the advantages to be gained in presenting in popular form, some of its messages on the moving picture screen and in the past four years has col-

lected a large number of reels that show many phases of the industrial activity as they relate to mining and metallurgical subjects.

You are² assembled tonight to see the "Story of Coal" which will be followed by the "Transportation of Coal."

The Story of Coal has been prepared by the Bureau of Mines with the financial cooperation of the National Coal Association. The latter association donated the funds to cover the cost of producing the pictures and the engineers of the Bureau planned the staging of the scenes and directed the photographers.

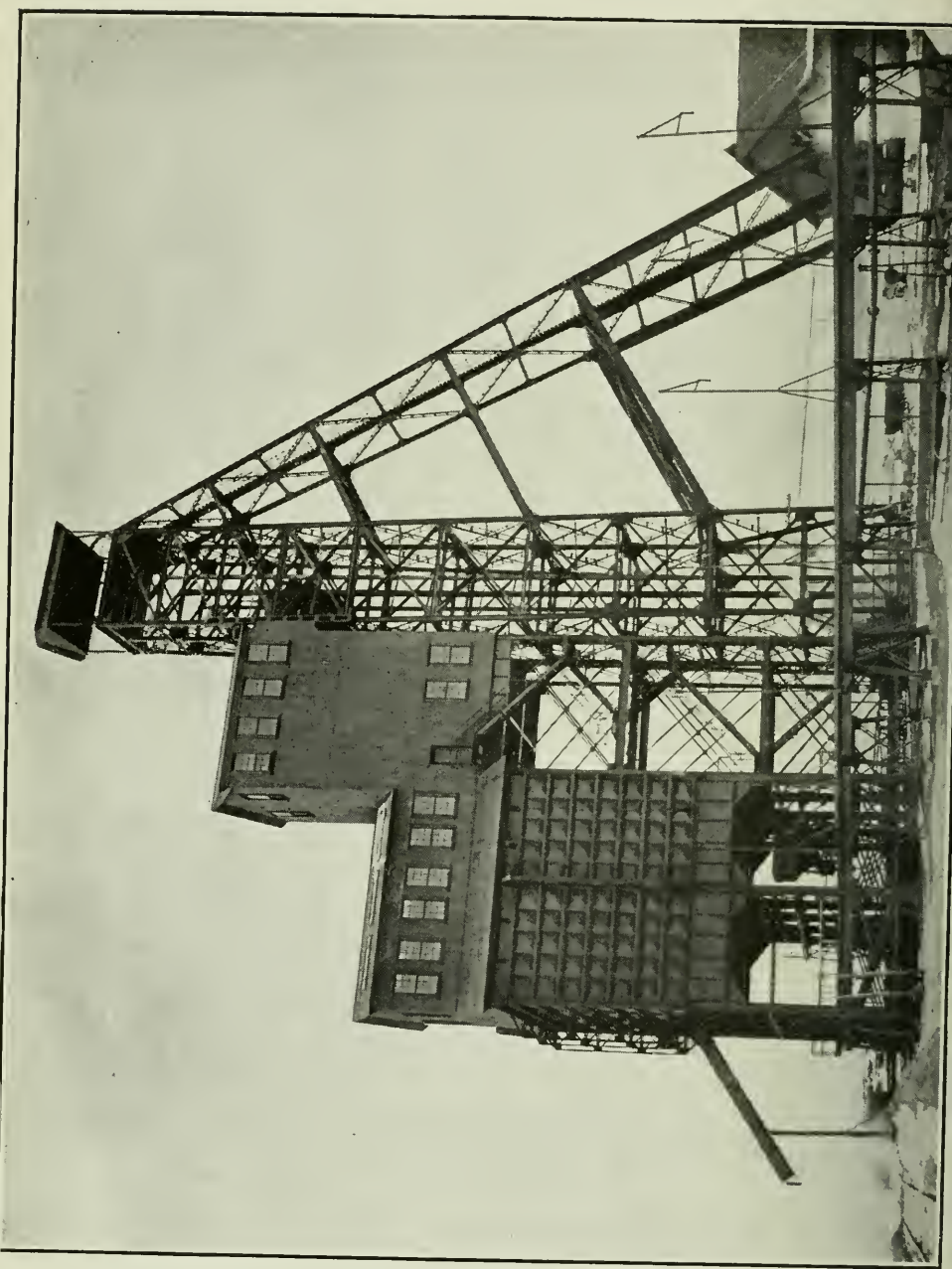
For reason of my personal relations in staging the underground scenes, it has devolved upon me to appear and make these preliminary remarks.

The Story of Coal shows all the various features of coal mining, beginning with prospecting it shows a diamond drill rig in operation, and passes to the sinking of a shaft with a temporary headframe and then the completed headframe of a large mine that is in operation. A panorama view of a mining village is shown, and a group of miners is shown at the surface ready to descent the shaft. The camera descends the shaft and makes a note of all kinds of activity within the mine. The trip through the mine is the first time the moving camera has been so used underground and on the screen you will see such scenes as though you were walking or riding through the mine. The cars and haulage motors are shown in operation and the details of mining coal with an electrical machine are shown.

Full detailed titles are given in presenting each feature of the subject, and the titles are displayed on the screen sufficient time to allow school children to read them.

Since this reel is still subject to amendment and additions, your constructive criticism is requested, and I shall be pleased to explain any features that are not explained in the picture, so you may feel free to ask questions at any time. The pictures will now be shown.

VICE PRESIDENT: As a usual thing we appreciate moving pictures of such people as Mary Pickford or Douglass Fairbanks, or scenes of romance or of danger. Tonight we have had an education. And while the expression,



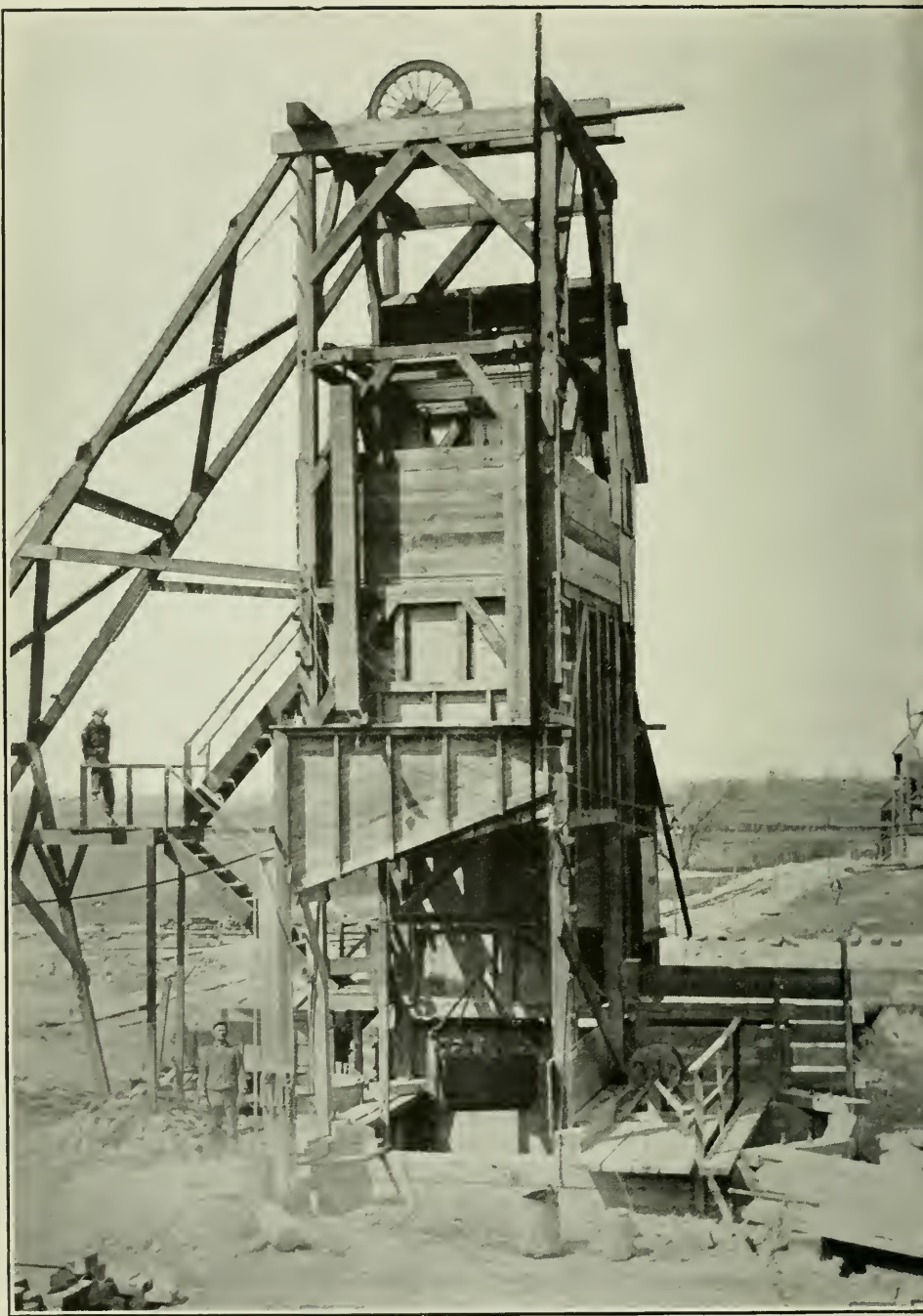
"carrying coals to New Castle," is usually understood to convey the idea of the absolute futility of presenting something that is known to everybody. I dare say the presentation of these pictures of a coal mine right here in this district to us who have known all about coal and lived here all our lives, has yet shown some of us for the first time something of the real working of the operation that we never knew before. I know there are a great many questions to be asked and a great many facts to be drawn out that can be applied to our various occupations, and I am quite sure Mr. Paul will be glad to answer any questions you may choose to ask.

MR. J. F. LENT: In those mines in Illinois which are 600 feet down, how do they take care of the problem of the weight after the coal is removed from the room? In our district they depend somewhat on the fall of the roof to modify the weight. I was wondering what they did where the shaft is as deep as that.

MR. PAUL: In this particular district where they have a cover of 600 feet they take out just as much of the coal as they can without trapping the miners, and with the system of mining which they use they do not get a really large percentage of recovery. They take out the coal until it begins to show evidences of roof movement and then they get all the materials out and quit. They work on a panel system about 600 feet long and 250 or 300 feet deep and when they have gotten about 60 percent of the coal out the overburden crushes the pillars that are left and they lose them. Of course, that subsidence extends up to the surface. In this particular locality the surface is not of any particular value for other purposes. The Company owns the surface and it is not of any great loss since it is not an agricultural community.

Mr. W. S. BRANN: On the Monongahela River we have 1¼-inch lump coal. We crush it for gas purposes. How much of the chemical properties has been lost in crushing, if any?

MR. PAUL: In the investigations of the Bureau on gases held in coal we find that in breaking almost any



SHAFT SINKING HEADFRAME.

bituminous coal you liberate a certain amount of what some people call occluded gases and that is principally a combustible gas that is largely methane. So you would only lose from a heat unit basis, the amount of methane that might be liberated in the breaking of the coal. Some coals liberate more than others. Some coals after loading into the mine car and when the car is brought to the surface you can light the escaping gases on the surface of the coal, but that is the exception rather than the rule. I do not think there is much loss from a chemical or heating standpoint, from the breaking of the coal.

MR. BRANN: The only reason I asked is that there was a question in reference to that coal after being crushed as to the gas when it was used immediately or placed in the stock pile and not used for a year, for a gas producing plant.

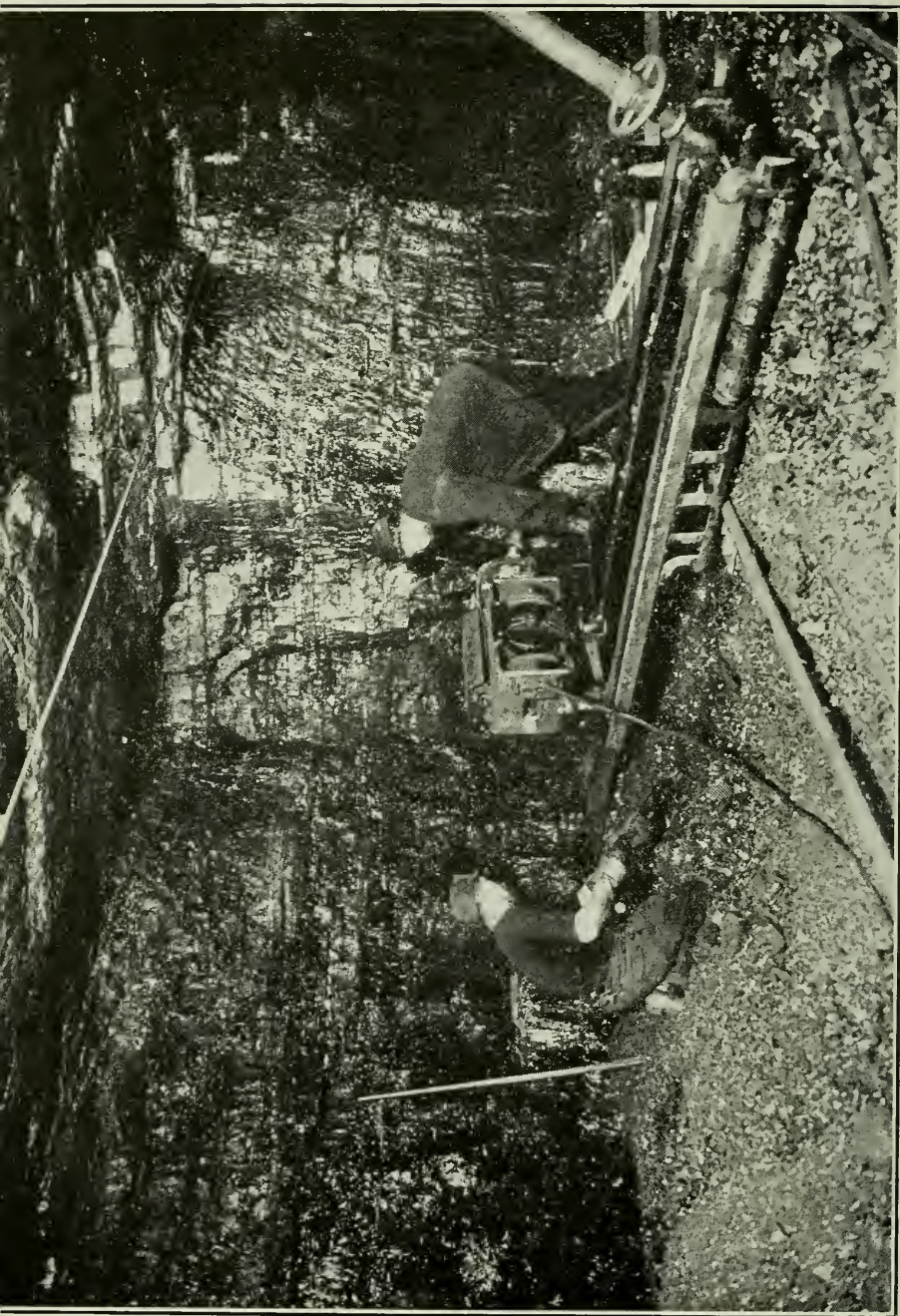
MR. PAUL: I would be glad if you would bring that special point to the attention of the Bureau in a formal manner, and we will be glad to give you the benefit of all the investigation that has been made along that line.

MR. J. C. WARNE: Does coal deteriorate on exposure to the weather in stock piles?

MR. PAUL: Very little. It oxidizes very slowly. It does absorb some of the oxygen. Coal has quite an affinity for oxygen. If you seal up a mine and make it air tight in a short time the coal will use up all the oxygen in the mine.

MR. WM. J. KNOX: Will you elaborate a little on the washing operation?

MR. PAUL: The principal purpose of the washing operation is to prepare the coal mined with the idea of reducing its ash and sulphur content, particularly the sulphur, since some coal in its natural state contains more sulphur than is permissible in metallurgical coke. It would take some considerable time to give the details of the process, as to either its theory or practice, but the coal is first crushed and sized and then put into jigs operated by the pulsation of water in a vat, and separation is made by reason of the difference in specific gravity of the coal, the slate



ELECTRIC COAL UNDERCUTTING MACHINE.

and the sulphur. The slate and the sulphur settle to the bottom and the coal cascades over the side into the bins.

MR. A. E. ANDERSON: What is the theory as to the formation of the roof over the vein of coal? The coal is supposed to result from vegetation. After that is laid down the roof is formed under water. But in looking at a vein of coal it shows very little if any deposits of foreign matter but it is almost pure clean coal, with a very small layer over the top, 4 or 5 or 6 inches of rock. When that was submerged the question in my mind is whether the percolation through the water and mud would not solidify, carrying with it more or less foreign matter which would make the coal impure.

MR. PAUL: That is a question on which geologists have agreed to disagree, and I as a mining engineer would not attempt to place you right on that. Most all men who have given the subject matter attention and study have ideas of their own in regard to it and they do not always coincide. I would not venture to start out on any theory to answer your point tonight.

VICE PRESIDENT: If there is no further question I would like to introduce another gentleman who is now a Pittsburgher, adding much honor to our community, being located here as the superintendent of the Bureau of Mines. Those who do not hear him will miss a treat, and after you have had the opportunity of meeting him, if you avail yourselves of his services you will find him a very genial gentleman, Dr. Holbrook.

DR. E. A. HOLBROOK: Mr. Chairman and Gentlemen: After that introduction I feel a great deal like the old maid who was proposed to. When I was operating mines my relations with the railroad men were that I was pleasant to him while he was around, because I was afraid he would not give me cars, and when he was not around I cursed him because he did not give me cars. Had I known you are all such good fellows as I have found you tonight I should have gotten into closer touch with you before this.

The Bureau of Mines here is of course particularly interested in the mining problems. You gentlemen have had

experience with government operation in your own line. I will not attempt to discuss that, it is not my province. I think however that it is only fair to say that in forming and creating the Bureau of Mines the government did not establish an operating business institution such as was attempted when the railroads were taken over. The Bureau of Mines, furthermore, is different from any other Bureau of Mines in the world in that we have absolutely no police powers. We can simply try by investigation and work among the people who are interested in mines and mining to better the conditions of the miner and to improve the industry. In doing that we take hold of a lot of problems that no one business is able to handle. Perhaps it is an investigation that would cost a private company thousands of dollars and from which it could only get a few hundred dollars benefit. They could not afford to do it themselves. However if we can do it and place the results at the disposal of the industry, we have benefitted the industry as a whole and have earned our right to our place in our special sphere of work. In that respect I believe the government may justify itself in the establishment of such a Bureau as our own.

Now you may wonder what we are doing that is of interest to railroad men. It is true we are perhaps doing little excepting that some of you will at least be interested in our investigations of combustion and burning fuels. We have a department which handles that work and which has from time to time produced results that I believe are good and acceptable in the combustion of coal under different conditions, and those may be obtained free by simply applying by letter to the Bureau of Mines head office at Washington.

Many of you who are automobile owners or interested in tunnel problems will be interested in the research work we are doing at present in the exhaust gases of automobiles. For example at present they are putting an automobile vehicle tunnel under the Hudson River and they suddenly discovered that the exhaust gases from the automobiles passing through the tunnel contain a poisonous gas, CO, and every man who uses the tunnel with an automobile is

likely to not come out alive. With the cooperation of many Pittsburghers and the fact that the tunnel company granted the Bureau of Mines \$30,000 for this work, up toward Highland Park we have been testing for many days many private automobiles and trucks to determine exactly the composition of these exhaust gases.

We have also had investigations under way in which volunteers breathe certain small percentages of these gases to determine when they begin to feel queer or knocked out. In studying that work and with the cooperation of the automobile owners we hope to have some valuable information for those who may be contemplating building automobile tunnels, or for tunnels of any kind in which gases are likely to occur.

I feel as though I had been blowing our own horn and I want to close by thanking all you members of the Railway Club of Pittsburgh for your very cordial reception of us here tonight. I thank you.

VICE PRESIDENT: On behalf of the Club, Mr. Paul and Mr. Holbrook, I wish to express to you our sincere and grateful thanks. It has been a rare treat, and we trust you will often come down to our meetings where you will always be welcomed.

MR. J. G. CODE: I believe that this Club should not adjourn without offering a tribute to the memory of one of our honorary members who has died since our last meeting, a friend to us all whose going we deeply mourn—Uncle John Brashear.

VICE PRESIDENT: Not only was Uncle John an honorary member of this Club but on different occasions he has addressed us and in his death we have sustained a severe loss, not alone as an organization but as citizens of Pittsburgh, of the great Commonwealth and of the Nation as a whole. He was one of our greatest citizens. In conformity with the motion, I ask you to rise and stand for a moment in silent tribute to our departed friend and fellow member.

There being no further discussion the meeting upon motion adjourned.

J. D. CONWAY, Secretary.

In Memoriam

DR. JOHN A. BRASHEAR,
Died April 9th, 1920.

A. B. BELLOWS,
Died April 17th, 1920.

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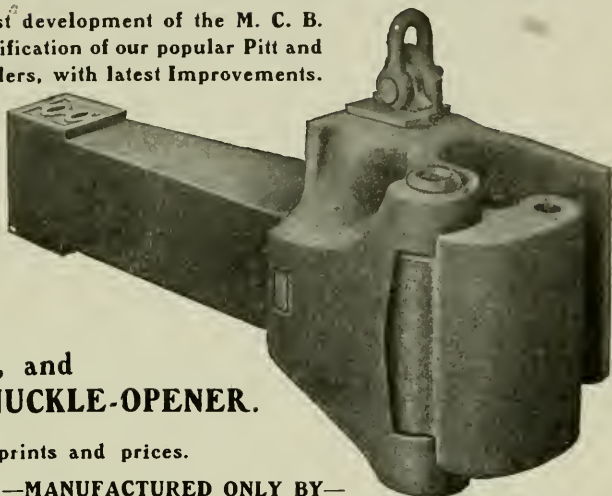
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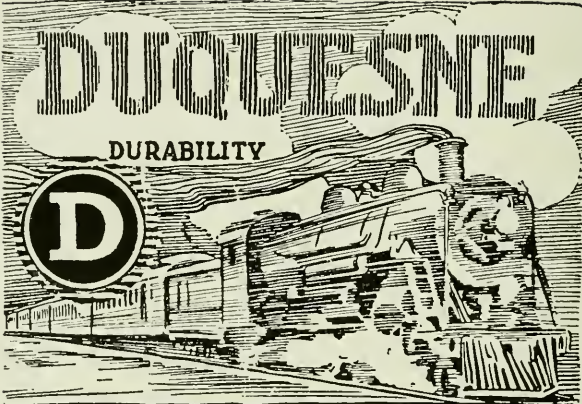
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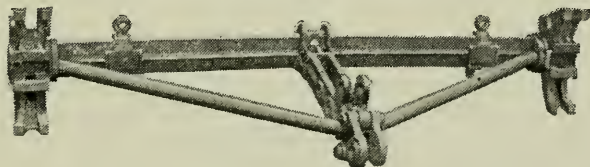
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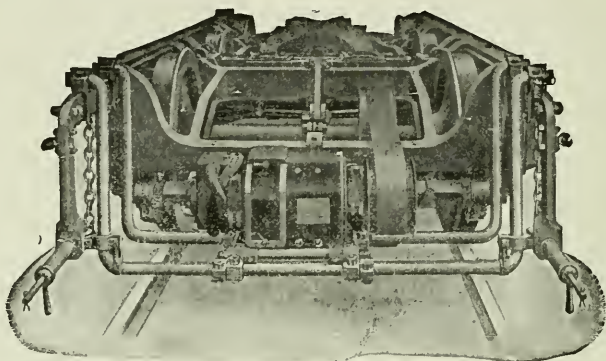
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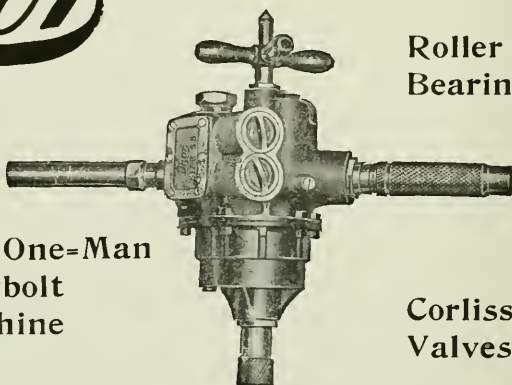
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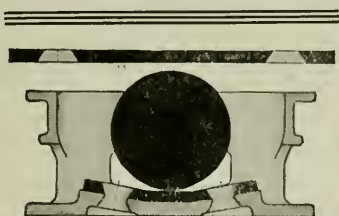
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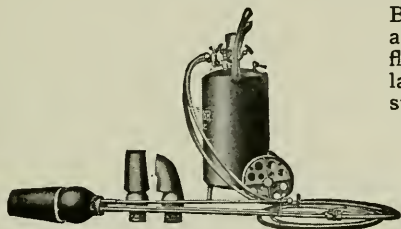
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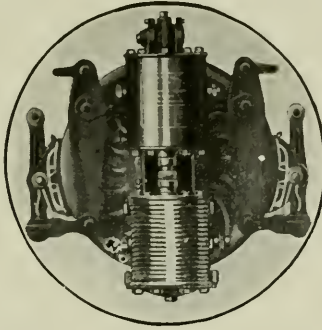
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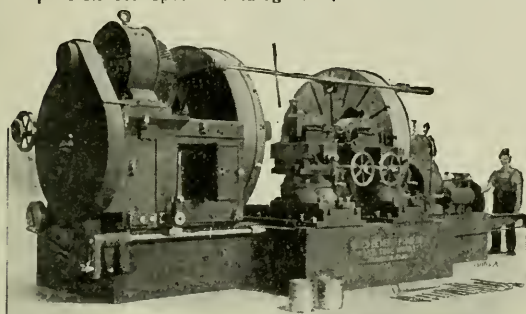
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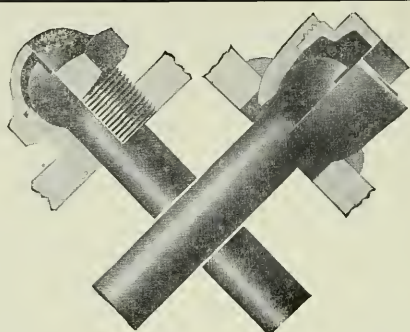
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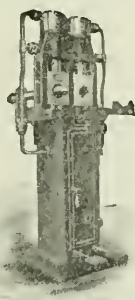
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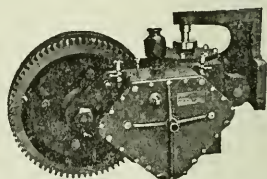
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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of May, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Railway Conditions in Foreign Countries."

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railway Club, F. O. Robinson, Secretary, Richmond, Va.
SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—Unveiling of Memorial Tablet at Railroad Branch of
the Y. M. C. A.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"Railway Operation and Maintenance Under a Divisional Organization" by Alfred Price, General Manager,
Canadian Pacific Railway.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—Smoker and Concert.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"The Steam Locomotive." Short papers on the subject were read bearing the following titles: Locomotive Operation, The Classification of Power, Locomotive Fuel Economy and Mechanical Phases of the Locomotive.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—Annual Meeting and Election of Officers.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"France and America" by Hon. William Graves Sharp,
Ex-Ambassador to France.

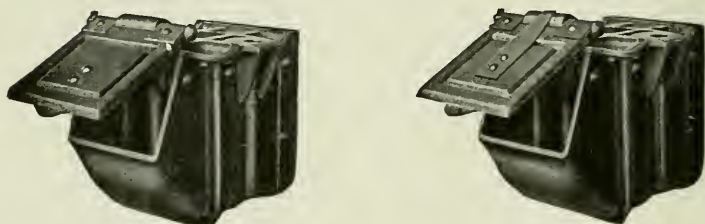
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Organized October 18, 1901.

Published monthly, except June, July and August, by The Railway Club of Pittsburgh, J. D. Conway, Secretary, 515 Grandview Ave., Pittsburgh, Pa.
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Vol. XIX
No. 7

Pittsburgh, Pa., May 27, 1920

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25c Per Copy

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Past Presidents

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
H. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.
J. G. CODE	November, 1916, to October, 1917.
D. M. HOWE	November, 1917, to November, 1918.
J. A. SPIELMANN	November, 1918, to October, 1919.

* Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING

MAY 27, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock P. M., President H. H. Maxfield in the chair.

The following gentlemen registered:

MEMBERS

Adams, Lewis	Devans, E. J.
Amsbary, D. H.	DeVilbiss, E. B.
Anderson, A. E.	Durant, C. H.
Babcock, F. H.	Eagan, J. T.
Barratt, R. D.	Elverson, Howard W.
Bartholomew, W. S.	Emery, E.
Batty, John	Fairgrieve, E. N.
Beattie, J. A.	Ferren, Robt. O.
Bell, R. P.	Fink, P. J.
Bird, W. Gibson	Forrest, C. H.
Blakley, T. M.	Frey, A. R.
Bonifield, C. P.	Gale, C. H.
Bowler, R. T. E.	Gaw, F. W.
Brandt, W. L.	Gillies, W. F.
Brower, J. E.	Glaseman, W. J.
Burel, W. C.	Gobrecht, J. C.
Calvin, A. W.	Grady, J. H.
Campbell, I. K.	Grieve, Robert E.
Carley, W. J.	Gross, C. H.
Charlton, W.	Gwinn, L. J.
Chilcoat, H. E.	Hale, Chas. E.
Chittenden, A. D.	Hampson, Vance
Christy, F. X.	Harris, J. P.
Clark, Harvey	Heckmon, C. J.
Code, J. G.	Herzog, Henry G.
Collins, W. H.	Hindman, S. M.
Conway, J. D.	Howe, D. M.
Copeland, T. T.	Huber, H. G.
Crawford, D. F.	Hudson, W. L.
Crenner, J. A.	Kaup, H. E.
Criswell, Harry B.	Keagy, C. O.
Crookston, W. G.	Keegan, J. F.
Cunningham, F. F.	King, C. F., Jr.
Cunningham, J. L.	Knapp, A. D.
Daly, P. J.	Lamb, W. J.
Dambach, C. O.	Lanahan, Frank J.

Lanahan, J. S.	Rush, Benj. H.
Laughner, C. L.	Scharpf, R. E.
Lehr, Harry W.	Searles, E. J.
Lindstrom, Chas. A.	Seiss, Wm. C.
Lloyd, John A.	Severn, A. B.
Lobez, P. L.	Sewell, H. B.
Long, Edw.	Silverolli, C.
Lower, N. M.	Smith, Jno. L.
Lynch, C. A.	Snyder, Jos.
Lynn, Samuel	Snyder, J. Rush
Matchett, H. K.	Spielmann, J. A.
Maxfield, H. H.	Stark, F. H.
Mitchell, John	Stark, J. L.
Monks, J. J.	Stillings, Wm. R.
Myers, W. H.	Stoller, Karl M.
McConn, G. E.	Stork, H. H.
McDowell, D. W.	Stucki, A.
McGaughey, J. V.	Sturmer, Geo. W.
McNulty, F. M.	Thomas, E. K.
Newburn, T. W.	Townsend, J. Fred
Nicodemus, Earle H.	Tutwiler, L. H.
O'Connor, M. J.	Van Vranker, S. E.
Osborne, L. E.	Wampler, J. S.
Peirce, E. C.	Ward, W. E.
Peters, W. B.	Warfel, J. A.
Potter, S. J.	Walther, G. C.
Price, W. F.	West, John W.
Proft, J. W.	White, A. B.
Rabold, W. E.	White, Chas. E.
Redding, D. J.	Wildin, G. W.
Reynolds, D. E.	Wilson, W. J.
Richardson, C. A.	Winell, K. O.
Ridley, R. C.	Wright, John B.
Roth, Philipp J.	Wyrough, C. J.
Rudd, W. B.	Yohe, J. B.
	Yohe, J. B., Jr.

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Alter, Glenn E.	Brant, W. J.
Baldwin, Stanley W.	Brooks, D. L.
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Davis, W. Harding	Nicholas, W. H.
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Ling, J. I.	Warfel, Curtis B.
Mahan, Wm. C.	Winner, Hubbs
Meyer, F. W.	Wells, D. L.
Minor, L. L.	Welten, S. A.

Roll call was dispensed with, the record of attendance being obtained through the registration cards.

The Secretary read the following list of applications for membership:

Allison, John R., Shop Inspector, Penna. System, 203 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. G. Huber.

Brown, Tom R., Vice President and General Manager, Hollis Tractor Co., Keenan Bldg., Pittsburgh, Pa. Recommended by A. Stucki.

Glynn, W. C., Asst. Freight Traffic Mgr., Penna. R. R., 812 Union Station, Pittsburgh, Pa. Recommended by H. H. Maxfield.

Graffious, H. D., Asst. Train Master, B. & O. R. R., 301½ Ringgold St., McKeesport, Pa. Recommended by C. H. Durant.

Koch, John J., Freight Traffic Mgr., Penna. System, 810 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. H. Maxfield.

McElvaney, Albert B., Market Reporter, National Coal Assn., 225 Bessemer Bldg., Pittsburgh, Pa. Recommended by Geo. C. Donaldson.

O'Donnel, R. L., Vice President, Penna. System, 903 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. H. Maxfield.

Pennington, F. W., Tech. Writer, Westinghouse Air Brake Co., Box 501, Wilmerding, Pa. Recommended by H. E. Chilcoat.

Saxer, Harry, Supt. Aliquippa Furnace, Jones & Laughlin Steel Co., 112 King St., Woodlawn, Pa. Recommended by D. H. Amsbary.

Shourek, Theo. L., Draftsman, Penna. System, 203 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. G. Huber.

Smith, Noel W., Asst. Gen. Mgr., Penna. System, 1009 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. H. Maxfield.

Stahlman, Miles C., Sales Dept., Pressed Steel Car Co., 1908 Farmers Bank Bldg., Pittsburgh, Pa. Recommended by C. C. Clark.

PRESIDENT: When these applications have been approved by the Executive Committee the gentlemen will become members upon payment of the year's dues.

Announcement was made of the death of three of our members, as follows: John Proven, Supt., Pittsburgh Spring & Steel Co., died May 5, 1920; D. C. Noble, President, Pittsburgh Spring & Steel Co., died May 7, 1920.

PRESIDENT: Appropriate memorial will appear in the Official Proceedings of the Club.

PRESIDENT: This Club is very highly favored this evening in having with us a gentleman whose name is as well known in the capitals of Europe as he is in this country; a native of the neighboring state of Ohio; a lawyer; a man of business; a statesman; a diplomatist; and withal a scientist of many years standing. The speaker of the even-

ing was elected for three consecutive terms to the Congress of the United States as a Democrat in a district that is overwhelmingly Republican. He was Chairman of the Foreign Relations Committee of the Congress of 1914 and was appointed Ambassador to France, arriving in France just before the great battle of the Marne, and during the two years and more preceding our entry into the great war he performed the very delicate and trying duties of that post with the greatest satisfaction, not only to our own government but to the government to which he was accredited. Upon retiring from that post he was decorated by the Republic of France with the Grand Cross of The Legion of Honor, the highest decoration which that government can bestow. I therefore repeat that this Club is especially favored in having this gentleman with us this evening, whom I have the honor of presenting to you, the Honorable William Graves Sharp, Ex-Ambassador to France, who will now address you.

HON. WILLIAM GRAVES SHARP: Mr. President, Members of the Railway Club of Pittsburgh: I thank your President very much for his kind words of introduction. But so much was said in praise of me that I am finding myself rather in the position of General Joffre on one occasion. The story goes that after attending a banquet in Paris at which a very talented speaker who had talked for half an hour or more telling his hearers all about the Battle of the Marne, Marshall Joffre turned to a gentleman sitting beside him and said: "Will you please tell me the name of the battle that he was talking about, I did not quite catch it." So I might well imagine that I had failed to catch the name of the speaker tonight from the laudatory remarks that were made by your President. I saved myself the embarrassment, however, by being one of you down here in the audience rather than having to sit on the platform and face you all with it.

I have chosen as my subject tonight the subject of "France and America." I have done that because it is a very broad subject, for I do not want any of you gentlemen to leave here tonight under the impression when I have finished that I did not stick to my subject, as I can say

almost anything about my experience abroad and still come under that subject.

I find that I have the same experience here that I occasionally find when I go out to accommodate some friend in other places, as I have here in the membership of your Club—my good friend and former fellow townsman, Mr. Stark, at whose earnest solicitation I am here, that I see before me men who served in France in the great war in some capacity or other. And I am told that your distinguished President of this Club served with great distinction on the other side. You will therefore understand my embarrassment when I attempt to tell you something about France, lest I stand condemned by those who in some respects know more about it than I do myself. Certainly they would know different phases of it better than I would. But I have had the good fortune when I have spoken under similar circumstances to be told on about every occasion by those in my audience who had been over there, that they were glad that they had a champion of France and her people. They had learned to love France. Though some of them, I take it, returned with some feelings of bitterness, remembering the cold rain and the water in the trenches and the poor food and the hardships and the dangers they went through, I believe that upon second thought they will come to remember only the good things of the country and of the people among whom they sojourned, and under such circumstances many of them will want to go back again.

It is a great pleasure to me tonight to tell you gentlemen who did not go over there, and of course you are largely in the majority, of the wonderful achievements of the men of your profession who helped in the work of the war in France. It was one of the great achievements that opened the eyes of the French people, and indeed of all the Allies, to the latent strength that lies in America. They had heard a great deal about the great republic across the water, they knew something about our wealth and enterprise and marvelous growth; but their attention had never been directed before the war to what we could accomplish, especially in such an incredibly short time.

Then above the achievements of the railway men and

engineers and scientists and professional men of all kinds over there was the stamp and kind of men you have, the character of the men who went over there, earnest, strong, able, sympathetic, men of not dissipated habits, men who lifted the name of America a little higher for having served over there, and who, coming away, left behind them the finest impressions upon the French people. I say these words not in flattery but in simple truth. As I had occasion to say before the American Export Manufacturers' Association a few months ago, the railway men especially, and I might also include the others to whom I referred, who as by magic improved the railroad systems and the harbors and sea ports of France, left such an indelible impression upon the minds of the French people as to the power, energy and capacity of America, that they have paved the way for a tremendously increased trade abroad. I remember going into one of the large establishments on the outskirts of Paris manufacturing aeroplane equipment, and as I went from place to place where the seven or eight thousand men were at work, I want to say without any exaggeration that ninety percent of all the automatic machines in that great plant were of American manufacture. And the same could be said of a lot of other manufacturing establishments in France. The power of delegating the intelligence of man, if I may so express it, to some machine that seems to be possessed of human intelligence, belongs pre-eminently to the American. And that fact above everything else your railway engineers helped to demonstrate to the French people.

Then in addition to the mechanical power, we become a great moral power. The soldier boys over there were the moral agents carrying out the spiritualized aims of the American government in entering the war on principle with absolutely nothing to gain but the triumph of right.

A few months before the signing of the armistice, when the intensity of the war seemed to presage an early conclusion, I received a cablegram from the Department asking me to send at my earliest convenience an outline giving the history of the different political elements that then dominated the French government. Those elements were

divided into three political divisions and I was asked to give an account of their different activities, the meaning of their operations, their influence on government, and what relative strength and influence our government might accord to each one of these divisions. I gave that request a great deal of care and attention, because in a way it necessarily involved the formation of some basic principles on which all of our efforts might be founded in making an appeal to the French government when the time came in the settlement of the war. But in framing my reply, which I may say was one of the most important of the many thousands I was called upon to send over from the Paris embassy during my four and a half years incumbency of that post, I felt that no matter how well posted they might be at the State Department, no matter how much in personal contact some of them may have been, no matter how experienced they might be in European politics or how much they might know of those factions in France, in order to understand the underlying principles on which those party divisions were based they should know something about France and her people. And so I prefaced my despatch on that occasion by saying that I felt that perhaps no intelligent conception of the meaning of the activities of those particular three divisions of parties that had been referred to in this despatch could be understood without outlining something about the French people themselves. I am going to give you tonight as briefly as I may a resume of some of the qualities that I found necessary or desirable in my despatch to outline to my government. If my words are full of praise for the French people I would not have you think that my residence among them for so long a time, under such unusually trying conditions, had in any way de-Americanized me. There is that tendency. I presume, and I am sorry to say that it is more than a tendency sometimes among some of our Americans who spend their time and money abroad, to forget their native country, to forget that splendid inheritance that we all possess, the advantages we have from being Americans and having been born in America. In fact I may say without any reflection upon France or her people that the longer I stayed abroad the more American I became and the more

I came to admire everything American. But along with that, I came to realize that there were a good many things in France among the French people that we could emulate here with a good deal of profit to ourselves. I know sometimes it is popular to speak in derogation of some of the present day tendencies—that we are money mad; that we do not think of anything but amusement, of the passing hour. There is a good deal of truth in that, perhaps more in the present day than ever before; too much of truth in it. We find a good deal of the same tendency over in France. But if I were to name the outstanding attributes of the French people, that have contributed so much to the high standing of the French nation, not only in this war but through all history, I would say first and above everything else, over there in France they exalt the mind, they exalt mentality, the person himself without the attendant attributes of wealth and rank and social position. It is just what the man is himself and what he knows.

I remember on one occasion not more than six or eight weeks ago a very talented young lady from near Paris who had been lecturing in this country, had been invited to our home town, and Mrs. Sharp was desirous of according her a warm welcome and invited her to our home, and there she spoke to quite a large number of ladies. I listened to her for nearly an hour that day in our parlor. She was soon to return to her native country. And she told so many truths about her own country, not in a bragging way, not in an all-sufficient, self-satisfied way, but just plain, ordinary truths such as you and I might tell them over there about America and still speak the truth. And then she pointed out so many things wherein she thought the American people were superior to her own. But when she had finished I went over and introduced myself to her. She said, "Mr. Sharp, it is not necessary to introduce yourself to me; I have already met you. I met you in the American Embassy in Paris while you were at your post there. I am an under attaché at Versailles. I have been assigned by our government to tell the American people more intimately what our needs are." "But," I said to her, "Of all the good things you said of your people today and of your great nation,

there is one thought you did not bring out which might have been brought out with a great deal of truth and which would have been of very great interest to your audience. You did not mention it because, I suppose, it was too present an idea to be regarded as anything unusual." I said to her that one of the remarkable things about France, and the most remarkable in the history of that nation perhaps, is that France is provincial to a degree more than any other nation on the face of the earth, living unto herself, exclusive, not undemocratic but unusually exclusive, not intermarrying, not traveling abroad, not colonizing, although she is the second power on earth in the extent of her colonies. That nation living unto itself has still preserved its wonderful virility for two thousand years. I remember of reading in the introductory pages of Ruskin, in that wonderful book, the stones of Venice, of his lamentation over the crumbling of those stones, over the passing away of the influence of that wonderful city of the Middle Ages which arose and fell even with her crumbling stones—but you could not write that kind of a page in history about the city of Paris. Paris after twelve centuries of existence is greater, more beautiful, more wonderful today than ever before; the Mecca of all the world, the one place where the intellect of the world gathers during all these troublous days of war. We boast in this country that our strength and our development is because of this intermixture of so many different races. Perhaps that is an element of strength. Perhaps it is best that we should be so. It has contributed to make the English people very great. But I can use a little story as an illustration to show you how very exclusive, how very provincial the French are, when I tell you a little incident that occurred in the train going out from Chicago the other day. I happened to fall in with two or three judges of the courts in Chicago and we got to talking about the different nationalities that went to make up the population of Chicago. According to their census Chicago had an estimated population of about 2,600,000. These gentlemen had cut out from the statistics somewhere, a statement of the different nationalities found to be living in the city of Chicago, that went together to make up that population of over two

millions and a half. It was estimated that 60 percent of the people of Chicago were foreign-born or of foreign descent. At the head we would naturally expect to find Germany, and so we do. Those born in Germany or of German descent numbered 398,900, almost 400,000. Then came the Austrians, Hungarians, Italians, Hollanders, Belgians, Swedes, (I do not undertake to give them in order), even the smaller countries of Europe, with from 50,000 to 100,000. I was greatly interested, and of course least surprised of anybody in the party, to find out how many France had contributed. I knew that notwithstanding she had over 40,000,000 people within her confines, she would be well toward the bottom of the list. So I asked him to give me the number hailing from France. He looked well down to the very bottom of the list and announced that France, that great sister republic of such wonderful history not alone in this war but for centuries past under empire and under republic, had just 2500 of her people in Chicago. And so you will find it in Pittsburgh. I have no question that there is hardly anything beyond a mere handful of Frenchmen in Pittsburgh. And the other day coming up into the city of Cleveland from the depot I received a shock when sitting in the street car in front of me were a gentleman and lady talking very volubly in French. I involuntarily said to myself, how many days and how many trips would I make on the street car before I would find this again. Hungarians just across the aisle from me, Germans everywhere, all nationalities but very, very few French. I do not mention this as some prized attribute of the French people; I do not mention it as anything to boast of; I mention it merely as a point of information that is so remarkable as to possess unusual interest and as not applying to any other power that I know of.

There sits in front of me a lad in this audience who just before I came up on the platform came up to me to greet me and said "I know you. I met you at Cambridge Springs." He met me at Cambridge Springs six years ago this summer at the time I received my telegram from President Wilson that I had been appointed to the post of Ambassador to France and he was one of the gentlemen who

escorted me in triumph from the hotel to my car in Cambridge Springs when I went away. A few weeks later, when I went to Washington, and just before my departure, Secretary Bryan invited me to the University Club to have a luncheon "intime," as they call it in France, where he and I and Ambassador Jusserand were to be the only guests at the luncheon. Mind you, this was seven weeks before the beginning of the war, and when I arrived in Paris a number of weeks later they told me over there that the most knowing fellow in Paris, the diplomat who was supposed to be closest to the real situation, was willing to bet not forty-eight hours before the formal declaration of war that there would be no war. So you can imagine that seven weeks before the war the cloud of that awful cataclysm had not yet appeared on the horizon. The biggest cloud there was between America and France at that time pertained to a dispute over the products of the Limoge china and Lyons silk factories which some of our Treasury agents had found undervalued and which had awakened some bitterness of feeling. Ambassador Jusserand had brought that matter up to me that day. But how trivial it was made to seem by the tremendous events that followed months later. I never heard anything more about the china of Limoge or the silk of Lyons. The great question was whether America would join hands with France as her ally and save the cause that means freedom of national existence, yea of personal liberty of the French people themselves! But I want to tell you of a sentimental story the Ambassador told me that day to show you the love the Frenchman has for France. I did not think so much of it at the time. I thought it was intended just as a beautiful little sentiment to regale Secretary Bryan and myself but it had no national application or significance. But I had not lived over there very long before I learned that was the essence of the very life of the French patriot.

He said, that away back in the days of the Crusaders a noble knight hailing from the vicinity of Lyons, where M. Jusserand was born, was stricken with a fatal illness and finding that he could march no farther, turned back that he might be taken home. He was brought as far as the boat

would take him toward Marseilles, and finding each day his strength waning he turned to his attendant and asked that he might be buried in his native town in France if he should die. Then when his illness became more critical and he saw that it was impossible that the ship could reach port and he be buried at his home, he said to his attendant, "If that be impossible, let my bones lie as near as possible to my beloved France."

That sounds sentimental, and it is so. But the French people are a sentimental people, and it is one of those traits that shows indelibly their provincialism. They love their homes. And those of you who have gone through France in the country inhabited by the peasantry have recognized that it is one of the characteristics of the country that they do not gravitate to the large cities over there such as is a dangerous menace in this country, economically if not morally, with an increasing tendency all the time to disorders, because where numbers are the tendency is toward disorder more than in the smaller communities. So when we pick up the census reports and see that cities like Miami, in Florida, have increased 400%, and other towns, like Akron, Ohio, with 200%, and many others 50% and 75%, you see that it means the depopulation of the rural communities. For our nation as a whole only increased 8% or 9% in the last decade, and when the cities increase more than that average percent it must be at the expense of the rural communities. And I imagine that the completed census of 1920 will show a rural population no longer of 65% or 70% but perhaps 40%.

But over in France, after 2000 years of national existence, or perhaps more accurately speaking, 1400 years of national existence, the rural population still remains above 65%. We have Paris with 3,000,000, Lyons with 700,000 or 800,000, Marseilles with about as many more, fifteen or twenty cities with from 100,000 to 200,000, but the rest of the seventy or eighty million people in France belong to the peasant class. And I want to say to you in passing, and I take the risk that most prophets take when they predict a day in France when precedent has no longer any weight or influence, no matter what you read about turmoil

in France or the gains in Germany of the Bolshevick power, I want to tell you France will stand as a granite wall against the progress of that disorganizing, immoral force, and it will be due very very largely to the conservatism, integrity, patriotism, honesty, uprightness of the French peasantry. It is the poorest kind of soil in the world in which to sow the seeds of disorder and disobedience to law among that peasantry.

I remember one day at a dinner at my home when I was entertaining the Premier Viviani, shortly after he had returned from America with Marshall Joffre, we got to speaking about the attempts of the Socialists and the Radicals in the French Parliament to overthrow the Government. That is one of their famous pastimes, to overthrow the ministry. During my stay of about five years over there I had to deal with five different ministries, though the last ministry, that of Clemenceau, lasted for two years and a half. In speaking of the likelihood of the Socialists overthrowing the Government and the great fuss they were making, this may seem contradictory to what I have been telling you, that the worst outbursts in our House of Congress in Washington are only as a pleasant gathering compared with what you may see in the Chamber of Deputies in Paris, because you would think Bedlam was let loose, you would think that instead of overthrowing the Government they would overthrow the whole of Europe. They throw at each other every kind of epithet. I remember on one occasion where Clemenceau sitting in front, for you know over there the Ministry hold seats in the Chamber of Deputies as members, a system which they have been trying to inaugurate in the United States, but from my observation over there I am more strongly of the opinion than ever before that it would be a very unwise rule to allow the members of our Cabinet to sit with the Members of Congress, either in the House or Senate; I think they are close enough together already. But as I saw one of the fiery Socialist orators of the extreme left that day standing up to the rostrum and the gray-haired Clemenceau sitting among his colleagues of the ministry six or eight feet below, violently criticizing the Government, I remember how one

Socialist Deputy rising from his seat exclaimed in a loud voice that everybody could hear, "Beware, beware, Monsieur, he is the Tiger." Of course that is what they called Clemenceau—the Tiger. Only the other day you picked up the paper and saw that the new President of the Chamber of Deputies, Paul Deschanel, we call him the Speaker of the House, had been compelled to adjourn Parliament because he could not restore order.

As I say, when I was speaking to Viviani, a man of long public career, a man who knows how to gauge his fellow-countrymen, I spoke about these peculiarities and I asked him whether there was any danger of their overthrowing the present government, and he said, "No. You have to understand the French people. Their activities are just like the commotion you see out on the ocean, rising here, falling there, making little billows, but eventually always finding their level. That is what they do here in France."

When you stop to think about the greatest crisis that ever confronted France, with all those seemingly discordant elements over there, with the Socialists all the time sought after by the German propaganda, by money and treachery and every possible way of detaching them from the support of the Government, you remember how their leaders were shot with their backs against the wall and others sent for long terms of imprisonment; then when you saw the Socialists over there engineered by this German propaganda stop the shops and the factories, you know how Clemenceau sent out this message, "Go to work or go to the front trenches." And one of the biggest manufacturers in France, a manufacturer of shells, told me one day that when the word went from him to the government that all his 11,000 operatives were threatening to strike, when this word went to Clemenceau, he sent back word that three or four of the leaders should be selected and sent to the trenches. They had some critical days in the very critical days of the war with the labor element there, but it would be very unjust to the labor element to say that all of them were actuated by any such spirit. Those laboring men were patriots or France could not have governed them as she did.

I spoke of the desire of the French people for learning.

Contrast this statement with what you might expect to find here in America. And I am very well aware that in this great industrial city of Pittsburgh, and be it said to your everlasting honor, you are a city of material progress, of great manufacturing development, and it is a most worthy thing, of course—that with all that, men of wealth have endowed splendid institutions of learning and institutions devoted to science and research. I do not know how many other manufacturing centers there are in the country that can boast of similar institutions, but I want to say that you are in the front rank as a city devoted not exclusively to manufacturing but to this side line of educational institutions. But it is the exception over here. Over in Paris if tomorrow morning you should pick up one of the daily papers and read of the death of one of the great railroad magnates or a great capitalist or some builder of a great industry, I doubt whether you would find, devoted to his life, more than five or six inches of space and a very brief reference made to it in the magazines and brochures, of which there are so many thousand printed over there. But had a Member of the Academy passed away, a great artist or benefactor, some man whose mentality had won him a place of fame in his community, you would see columns and columns devoted to his career, magazine articles and books devoted to his life. They extol the mind and it is their ambition over there to become men of learning rather than materialists.

I remember one day visiting an institution of the Prince of Monaco. The Prince of Monaco is a scientist. He is a gentleman whose acquaintance and friendship I prize very highly, and I had the pleasure of knowing him very well and being more or less of a frequent visitor to his home, as he was to mine. On one occasion I attended, upon his invitation, a lecture upon oceanography. I remember that when he learned that I had devoted a great deal of my spare hours for many years past to a study of the science of astronomy, he turned to me and said "You interest yourself in things celestial. While you gaze upon the stars and seek their message, I am delving down to the bottom of the ocean for deep sea life. I study oceanography." And he

has erected, among several institutions, a splendid institution in Paris that he devotes to that science. After hearing the lecture and seeing a most wonderful exhibition through his movies, I passed out the door with him and around the side of the building and there upon the wall was a tablet of bronze and on it was recited that His Highness, the Prince of Monaco, was the founder of this institution. I said to him "Your Highness, I am not just, but you attach more importance and have more pride in being known as the founder of this institution than as the Prince of Monaco. "Oh yes," he said, "because in one case I made the name for myself, and in the other I could not help it; it came to me by birth."

This story may interest you a little to show you something of my experience, not only of diplomacy but just what one prince can do under the stress of war to the fortunes and property of a cousin prince. I had not become comfortably seated in my position in Paris more than three or four weeks until one day I got a message from the Prince of Monaco that he would like to see me. Of course when you get a message from a Sovereign you are not expecting that he will come to see you, even though you are the American Ambassador. Your colleagues will come to see you, especially the representatives of the smaller governments, but when you get a message from the Premier of France or from a man like the Prince of Monaco, it means go to see him.

I desired to make the acquaintance of the Prince of Monaco. I desired also to know what service I could be to him. I was ushered into his room that day and he explained what he wanted me to do for him. He said he had to pay a ransom to the German government of \$100,000 in order to have his chateau between Soissons and Nancy saved from the German army and the dwellings of his tenants, numbering 800 or more. He had to send that to the German government in the next few days and he asked me if I would be good enough to communicate with my government, asking if they would be what we might call stakeholder. Of course he did not put it in quite that way, but he wanted my government to be the custodian of the

\$100,000, that is the medium of exchange to convey that to the German government. At that time we were not only not at war with Germany but we had German interests to protect. And if you think that my job was made any easier by being not only not at war with Germany, but the biggest power on earth, and with France looking with longing eyes to us, all the time beseeching us in everything but words to join them, and then going out and being tender and solicitous for the German prisoners that a week before had destroyed beautiful cities in France—if you think that added anything to the pleasure of my position you have another think coming. I had that work of looking after German prisoners for two years there. So it was natural that he should ask that my government help him to the extent of sending that \$100,000 to the German government. I had the thought in the back of my head that the less trouble I could hand out for my government at Washington to meet, the more liked would I be in Washington. I did not care to commence putting up problems of that kind to Washington, so I began to think of a way to sidestep the Prince's request. Finally I hit upon the thought that it might be an easy way out for the Prince to send his \$100,000 over to Switzerland through the French government and there it could be turned over to the Germans, who also had their resident minister at Berne. I do not want to say that the Prince was obtuse enough that he had not thought of that; I am only thinking, as I have on several previous occasions, that the Prince was somewhat solicitous to have in some remote way the United States government identified with that transaction. Perhaps the sequel will explain how it might have aided him. At any rate the \$100,000 was paid. And he showed me a copy of a letter a few weeks later which he had received from Emperor William, to whom he had written, asking him as a sovereign prince and as a colleague to save his property, and recalling past friendships of many years standing. For I do not believe there is a prince or potentate or leader in Europe that the Prince of Monaco did not know and had not gone hunting with. He knew the Emperor William very, very well. And for sarcasm this letter was not excelled by anything I ever saw.

It went on to recite that the Prince of Monaco of course would suffer a very great harm in the loss of his property. He regretted very much that it became a military duty to destroy such property. Then he went on to lecture the Prince of Monaco for having shown his sympathy to an enemy power. But he concluded by promising that the Prince's property should be left immune. The irony of it all came from the fact that the beginning of the letter addressed the Prince of Monaco as "My dear Cousin." I understand that is the protocol style of one monarch addressing another in Europe. Just how dear that affection was you may gather from the sequel of my story. Months and months after, I was at dinner with him one evening and across the table from me on the wall of his dining room was a very large painting of his chateau, which had been built several hundred years before and was one of the noted places in that country. I asked him the fate of the chateau. He said, "In spite of the \$100,000 that I gave him as a ransom, my furniture was stolen or destroyed, the most valuable tapestries and paintings and silverware taken and in their place substituted the cheapest kind of trash. And on my estate those Germans cut down 47,000 of my old trees, some of them from 100 to 200 years old, and they are laying today scattered all over my place." That was the fate that fell to the estate of the Prince of Monaco and it is the fate that fell to the lot of thousands of other beautiful chateaus of which I could tell you for hours and hours, places that a few days before the war were the show places of France, and now they are desolate. And along with them went their people.

But there is another attribute of the French people beside the attainment of knowledge. Some time ago in speaking of the French people I said I thought I knew of no race of people that were moved more by a sense of deep religious conviction than the French people. A friend of mine said, "That surprises me. I had never supposed that before. I had not thought of the French people as especially religious." Perhaps he had the same point of view as a business man I met on the steamer going out of the harbor of Bordeaux in 1916. He turned to me and said, "What

licentious people, immoral people, these frivolous French people are." He looked like an intelligent young business man. I said to him, "How long have you been over here in France?" He said, "Three weeks." I said, "Where have you spent your three weeks?" He replied, "In Bordeaux." I said, "Whereabouts?" He said, "I saw them upon the boulevards and in the cafes, and the scenes I saw there were indicative of anything but a moral life among the people." I said, "If you wanted to see that kind of life there was no occasion for your leaving your home in New York City. You could have seen infinitely worse by walking down many of the lower streets in New York." And you have people leaving the city of Paris with the same impression. They do not know the home life of the French people. They do not understand the meaning of the erection of those beautiful cathedrals, so many of which were destroyed by the fire of the German army. They were not interested to see as I saw, not only Sunday after Sunday but nearly every day through the week, great crowds of worshipers going in and out of the doors of those churches. And barring the men who were at the front, there were just as many men as women at those services. They were the fathers of the boys that had gone out to the front.

The story goes, and I have no question about it at all because Marshal Foch is a man of religious convictions, that before each battle, and before important conferences, in fact in the morning of the day given over to his important duties, the first duty is the prayer at the church.

France is a religious nation. And it does not make any difference whether it is Protestant or Catholic or Jewish, they have that religious conviction and they practice it. And I think I speak with an intimate knowledge. I speak of my own servants in my own household who were there with me in my family for five years. I speak of the peasant class among whom I visited. I speak of the men and women in the streets. All honest, all upright, all moral, all actuated by a deep sense of conviction that they have a responsibility to society, an accountability to some supreme being. I have been in taxies many times and I have seen others where the driver who could not take me or could not take somebody

else, never failed to hail at the next corner another driver and send him back for this person, thereby not only giving employment to his fellow driver but doing a kindness to this fellow waiting on the corner. That is inborn in them. When you speak about the politeness of the French people, it is not a veneer; it is not a politeness that is merely on the surface; it is an inborn desire to be of some service to his fellow man.

One day at a reception to one of the kings, for we did not only have President Wilson there as a visitor but we had almost every king and potentate in Europe in Paris at different times and it was my privilege as one of the diplomatic corps to meet those men. And in passing I want to say that though you may belong to the Americus Club here, I know that if you had been in my place over there the question of politics would not have entered your mind but you would have been very proud of your Executive compared with the kings and princes of Europe. I am not getting into politics because if I had to make an honest confession to you I would have to tell you that the Lord only knows what my politics is going to be this year. I may vote a ticket that you have been voting in the past and you may vote the ticket I have been voting in the past. You can't tell. But in talking on the train the other day with a very ardent Republican that used to be in my old Congressional District, who had just been around the world, he said, "I think all of us really to appreciate America and everything American ought to go out and take a view back over our country's retrospective. I have found during my travels that I have become less and less partisan, that I found myself full of pride, not in being a Republican back home, because they did not know anything about Republican and Democrat over in those countries, but they did know what an American was, and I found myself being proud that I was an American regardless of my party. And that is what you find over there. If I met with any success at all in my administration over there I want to say that a very large percentage of it was due to the fact that the American flag was above my embassy door. Whether my name was Sharp, Smith or Jones, the fact that I represented the Ameri-

can government was enough, because that is the way they regard the American government over there. I do not want anyone here to think that they dislike us in France; I do not want anyone here to think that they dislike us in England; I do not want anyone here to think that they dislike us in Europe; I do not believe that. I do not believe that President Wilson is any more disliked now than he was when he first went over there, and he was the idol of Paris when he was there. Riding in a car with Clemenceau fourteen days after the armistice in the fourth car in that procession in honor of President Wilson, going up the Champs Elysee, with the plaudits in our ears of a million people, just as we were going around the base of the Arch of Triumph he turned to me, Clemenceau the idol of the Paris people, and said, "I have never in all my days seen a procession like this in Paris; I have never seen a reception equal to this that is accorded your President." That is the way our people are regarded over there.

There are just two scenes and then I am going to close. One has to do with another attribute of the French people, and incidentally it will tell you of an episode, one of the many hundreds over there of intense interest, that came within my own experience, which for obvious reasons never found itself in print. It occurred about four weeks after the armistice. And that leads me, as my second scene, to refer to the signing of the armistice and what brought it about. I do not know what you gentlemen would say in your minds was the greatest achievement of President Wilson during the war, but to my mind, among all the notes which he sent over there to the European powers, first as you know to see if he could not bring about peace—because no man more genuinely strove for peace and to bring about peace before the knock out blow should come and before we got into war, than Woodrow Wilson. His notes show it. And though we may not agree with the wisdom of those notes, yet they were wonderfully effective, especially those that brought about the armistice. In vain had he besought Germany—and it was my duty on those occasions to hand those notes President Wilson sent over there into the hands of the Premier. And I remember Premier Briand, a great

statesman of France, showing me a picture one day of himself and the Minister of Foreign Affairs, and myself as the American Ambassador, in his private room, he handing to me the answer of the Allies to Wilson's peace note just antedating our going into the war. It was a note that was representing the concerted action of the Allied powers and it was Premier Briand who had the distinction of handing that note to me.

And you will remember that in reply to that note of the Allies President Wilson referred to that note as having gone very much farther than the German note in stating the purposes of the war. But it was of no little embarrassment to the Americans at that time to have France and Great Britain and the other Allies show, I would not say their indignation, but their dissatisfaction with President Wilson's inquiry in one of his famous notes, "What are you fighting for?" The Allies could not understand the meaning of that question. But it was the leaning backward of President Wilson to not precipitate the war unnecessarily; it was the leaning backward of President Wilson to be fair even to Germany. And then another note brought that famous expression of his, advocating peace without victory. And that again went against the sensibilities of the Allied powers, who could only see all the time the justice of their cause and the injustice of the enemy.

But those were trying times, when Germany had the opportunity more than once, only used it partially in the Sussex case, and then bringing up with a stern hand guilty Germany to its accountability, President Wilson exacted from Germany a specific pledge that they would desist from their unrestricted submarine warfare. They made an honest attempt to keep that pledge for ten months, and then came that tragic moment. I used to hear a good many of my friends speak about the psychology of the German mind and how stupid they were, and this and that. Of course I could not subscribe to the statement that everything Germany did was stupid because they pulled off a lot of things that came as a great surprise to the other side. But this had no reference to diplomatic mistakes. When the true history of this war is written there will be just three outstanding mistakes

that will overshadow all the others committed by Germany. The avoidance of the first mistake would have avoided the whole war, when by just a shake of the head by Emperor William to Austria at the time she named those ten or eleven humiliating conditions upon little Serbia and Serbia had agreed to every one of them but just one and the agreement to that one would have effaced her sovereignty altogether, just a shake of the head by Emperor William protesting against the attitude of Austria, who most needed Germany in any kind of war she could wage, would have prevented war. Then instead of seeing that military genius and statesman of the Allies rising out of the mass of men and going down in history as the great man of the war, Emperor William would have been the greatest, because he could truthfully have said, "If I had told Austria at that crucial time never will Germany enter this war unless her territory is invaded, there would have been no war." But Germany did not do that. What was done underneath we can only surmise, but every indication is that Germany gave encouragement to Austria and the war was started on its horrid course. That was mistake Number One.

The second was the crossing of Belgium by her armies and the violation of its neutrality and her solemn obligation. That brought England into the war, and that was the second great mistake.

Now the last, and in some respects the most tragic of all, was when Germany, with what you might call the olive branch of peace held out by President Wilson—and it was no less a personage than Ambassador Gerard himself, when coming through Paris after he had resigned his mission, told me in so many words that if Germany had not handed him that note going back on her pledge made in the Sussex case, Wilson would have had peace in three months. That was the opinion of Gerard expressed to me. But the war was brought on when Germany violated her pledge in the Sussex case and then commenced on a day's notice the resumption of the ruthless submarine destruction of our merchant marine. Then in honor and self-respect we had nothing else to do but get into the war. And that was the third great mistake of Germany.

Years rolled by. Herbert Hoover, whose name is upon everybody's lips, used to come into my office in those days. In the early days of the war he had entre back of the German lines. He was feeding Belgium through the Commission, and he had daily conversations with German officers. I remember one day in early 1915, long enough after the battle of the Marne that Germany began to see the handwriting on the wall. Mr. Hoover said, "Germany is in a panic for peace." That early Germany wanted peace but she wanted it on her own terms. She wanted peace a little later, and on terms not quite so severe. And then after our boys got in—and your honored president of this Club knows so much about our boys over there. General Duggan just a week before the armistice when I had gone clear over to Nancy to help dedicate a monument erected to the first three American soldiers that fell on French soil, sitting at my side, he turned to me—and he was General of the Algerian division, which was one of the most noted divisions in the war for bravery—and he said to me, "Do you know that your men are the best fighters of the Allied armies? At Chateau-Thierry I found myself on one occasion sandwiched in between two of your companies and I never saw such valor in my life. I never saw such utter disregard of danger as your boys showed on that field. So precipitous were they that by their very example they compelled our boys to follow them." That was the verdict not of a "conceited American" but of a French soldier.

Do you wonder whether I am telling you the truth when I tell you the French people love America and the Americans? They are not going to forget such deeds of heroism as that. They have the same love and admiration for us today and will have for all time to come. But it was those days, it was the ardor of the American soldier that finally got Germany into not only a panic for peace upon her own terms, but upon any terms. Like some nightmare of dread for Germany, what a terrible, terrible thing that was for the "greatest military power on earth." For I want to say to you that the results of the war did not demonstrate how weak Germany was but how tremendously powerful she was.

But Germany tottering, it was then in my humble estimation that our President not only rose to the occasion but performed the greatest achievement, one fraught with the best of results of any that characterized his administration during the war. Ludendorf has told you in the daily papers of the efforts of Germany to secure peace. You who read his articles read a revelation that was only glimpsed at by the Allies during the war. I got a cablegram from Washington. It briefly said this, "We are sure that the French government must be in possession of many facts about the things that are occurring in Germany back of the lines, many important things that we would desire to know ourselves. Will you secure access to them." When I went to the Minister of Foreign Affairs he said, "Alas, we wish we had, but we haven't got them. Of course we are willing to give you anything we have."

There is just one exception to that, and it involves a story of intense interest. If I do not give you names you will understand why. I said that we were woefully lacking in real facts back of the German lines. It seemed as though there were an impassable wall through which, and over which, nothing could pass, all the way from the Swiss frontier clear up to the Channel. But something did get over the wall once in a while, in this new and mysterious magical agency of the wireless. As you know, Ludendorf complained that more than once he had brought to the attention of the military government at Berlin the fact that their code was known to the Allies and nothing was secret. And he spoke the truth, and I will tell you why I think he spoke the truth. One day I got a peremptory demand to come over and see the President of the Council, Clemenceau. I went over to his office in a dingy old building that the Germans attempted to destroy and did hit once. I had no sooner entered his room than he pressed a button and his clerk came in. He asked him to get a certain message. The secretary disappeared and came out again in a moment and handed the message to M. Clemenceau who handed it to me translated into good English. This was a wireless message picked up from the top of the Eiffel Tower. I have wondered whether that distinguished French engineer

ever dreamed when he built that toy tower, ever in his wildest flights of imagination, dreamed of the utilitarian purpose to which it would be put and that it would so soon serve his country in such a momentous crisis.

This message purported to come from a German military attaché from the capital of a neutral country, and it said something like this, "I am getting information that I consider of value showing the possible plans of the Allied forces from a certain attaché connected with the American embassy here and I hope to send more information to you. The attaché's wife is absent at the present time in such and such a place." Of course it was a very important piece of information. So going back to my embassy I knew one of my secretaries who had come from this capital some months before and I knew all I had to do was to ask him a question and I would solve the question as to the identity of this particular person and my guess in connection with him. And about two minutes after I put the question to him I had all the information I wanted and Washington got it the next day. About the day afterward I got information from Washington that a certain secretary was on his way home and I took that information to M. Clemenceau. He looked it over and he said, "We knew it." He rang the bell for his secretary and said to him, "I wish you would get me such a telegram." The Secretary disappeared and came back in a moment with a telegram that read something like this—a wireless again taken from the top of the tower, "I am sorry to report to my government that So and So has been recalled by his government and I am unable from now on to get any information." It is no wonder Mr. Ludendorf complained that the code was obsolete. So that though much information as to conditions in Germany was suppressed by a strict censorship, we did get information from Germany at times.

So when the time came and the shadow of defeat passed over France from the western horizon and the doom of Germany was seen by everybody, then came this appeal for an armistice. Ludendorf in those letters has said that they found it useless to appeal to the French government or the British government, they could not get any favorable re-

sponse there. And Lord Lansdowne hit the nail on the head on several occasions, and none more accurately than when he said that when the Allies are winning they will not talk peace because they see that psychologically it is the wrong time. We are winning. And when they were being defeated they would not talk peace because they saw that psychologically they could not do it because it would be an evidence of weakness to the enemy.

That was the situation that confronted both of the great armies on that occasion. Then came this wonderful thing, this strange, unusual, historical event of the Emperor of Germany sending that appeal here over the heads of the French government, over the head of the British government, over the head of the Italian government, even though Italy had been an ally of Germany, and clear over to America and to the man that she despised more because to him she attributed her defeat, Woodrow Wilson, that appeal for an armistice. I should say, if I am any judge of the situation at that time, that that was the wisest thing Germany had done for months and months. It took a lot of courage when that S. O. S. call came out of the east for Woodrow Wilson or Clemenceau, if it had been addressed to him, or Lloyd George, if it had been addressed to him, to have answered it at all. I do not know that I go too far in saying that it took more courage than Clemenceau or Lloyd George might have shown at that time. While there was an unmistakable yearning in the hearts of the French people, as well as the English and the Americans, that the war might end, that the bloody carnage might end, yet it needed a spokesman to take the initiative to end it and Germany gauged Wilson right, both as to the time and the person and the kind of message, when it sent over that S. O. S. appeal asking for an armistice. And though it was portent of the most awfully humiliating consequences to Germany that were ever meted out to any great power, I still believe today the most welcome news that came to Germany was an answer at all to their appeal. They got their answer, epitomized in a few great words—"What do you want? Then they commenced to tell what they wanted. And I claim today that when all the facts and the meaning thereof

have been analyzed and studied, the achievement of President Wilson in drawing Germany out in those successive answers as to what they were willing to do, when they wanted to do it and the terms on which they wanted to secure an armistice, was compelling Germany and did compel Germany to lay finally her cards on the table face up. That was the achievement of President Wilson in his series of matchless notes to Germany. And these cards when laid on the table spelled humiliation, surrender, the abject surrender of Germany. Her soldiers, valiant, fighting unto death even as the soldiers of the Allies, though in a wrong cause, would not fight as they had fought before when they knew that the end of the war was there. They would not rush a position today if tomorrow the necessity for rushing it ended. And the initiative, the spirit was taken out of Germany and the German army from the day the appeal was made for an armistice and Germany knew it. They wanted to end the war and it was ended. So the happiest day in all France, as it was all over the world, not alone in Allied capitals but in the capitals of the enemy powers, was the 11th of November, the day of the signing of the armistice.

That is one picture. The last picture can be more briefly told. If there was any one condition that France wanted to see fulfilled and would insist upon before any ending of the war except the absolute victory of the German armies, it was the recovery of Alsace and Lorraine to the brotherhood of France. So when finally the opportunity came to go back to Alsace and Lorraine after fifty years of separation, President Poincaré, with that pride that is entirely excusable and laudable, arranged for three special trains carrying hundreds of Members of Parliament, of the diplomatic corps, of the ministry, of men in high places, took those trains out of Paris on the night of the 7th of December, 1918, and the next morning they went into Metz. I remember at the breakfast table Paul Deschanel, then President of the Chamber of Deputies, not President of the Republic, deplored the fact that as we passed down through Alsace and Lorraine how different it looked from the French towns that had been ruined forever. But there was one

exception to that, there was just one town as we got over the border into Germany just a few miles outside of Metz, seeing which I said, "Are we not in German territory?" He said, "Yes, this is over the border." Said I, "How comes it that this building and that building are destroyed, so similar to what you see over in northern France?" He said, "Oh yes, these buildings are the only buildings in Germany to be destroyed by the Allied powers except those where big bombs had been dropped. Those buildings were destroyed by General Pershing." How poetic, withal, that America, coming 3500 miles, should finally be the only one to inflict physical damage upon German soil. So it is not any wonder at all that that day in the streets of Metz and from the top of every building you saw next to the prevalence of the tens of thousands of French flags were the American flags. The story of the Argonne had been told and that was nearest to the soil of Alsace and Lorraine.

The next day we went into Strassburg and what I saw there at the end of the program will illustrate this one attribute of the French people that I can not help but wish we had more of over in America, and that is absolute, unswerving, unconditional respect and obedience to the law. Down at the foot of a very interesting program of the ceremonies of that day in that old town of Strassburg of 200,000 people, suddenly swelled to 600,000, after witnessing the civic parades and the wonderful scenes on the boulevards and from the reviewing stands across the square, the French flags flying from the top of the tower of that wonderful Strassburg cathedral for the first time in fifty years, just on a single line at the bottom of the program, where every visitor's eyes were transfixed there ran the simple statement, "A visit to the Strassburg bridge and across into Germany." And so on that 9th day of December in the gloaming, it had commenced to sprinkle just a little, we took our automobiles and went down to the Rhine, which was about two miles from the center of the city, and there in addition to my desire to cross into Germany I wanted to see the Rhine which I had seen 35 years ago. Talking with General Pershing about the scene, ahead of me Clemenceau and Poincaré and many members of the ministry and govern-

ment, we went on to the bridge, which must have been 100 feet wide, and went across to the center of the bridge, and suddenly like a baleful apparition before our eyes was stretched a barricade and back of that barricade an ordinary German sentinel with his gun. Surprised beyond measure that such a structure should exist, Clemenceau asked the guard the meaning of it. He said, "I am commanded to forbid anybody to pass this point." "But is it not our right to do so, is it not after the armistice?" "No," said the guard, "it is the one bridge at this point that is not included within the terms of the armistice and you can not pass here." And then came back the reply, so I was told by the lips of Clemenceau, the Tiger, Clemenceau the man of courage, Clemenceau the fighter, the hero, the idol of France, who by just the wave of his hand could have commanded those back of him to brush aside that little spider web of obstruction and crossed into Germany, that coveted goal, then came the answer that deserves to be preserved for all time in history, "If that be true, we as Frenchmen will show to you how much more sacred we regard our national obligation and our national honor than the Germans."

MR. J. G. CODE: Pittsburgh is proud of the personnel of her railways and her industries represented among us, proud of her churches, proud of the war record of her citizens. We are proud especially to have with us as our guest so distinguished an internationalist. I would move that an expression of the thanks of this Club to the speaker for his splendid address be extended by a rising vote.

The motion prevailed by unanimous vote.

There being no further business, ON MOTION,
Adjourned.

J. D. CONWAY, Secretary.



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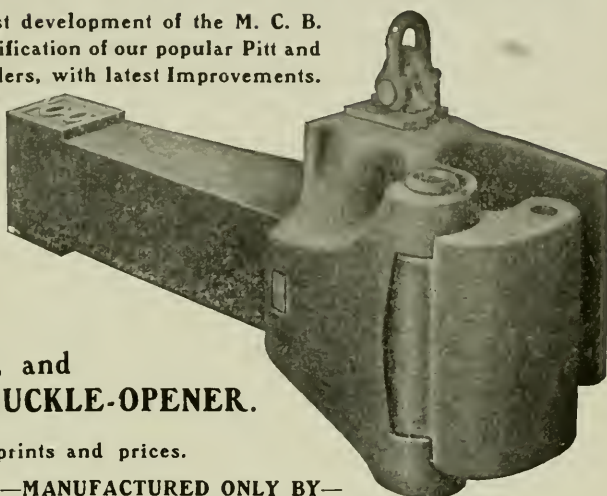
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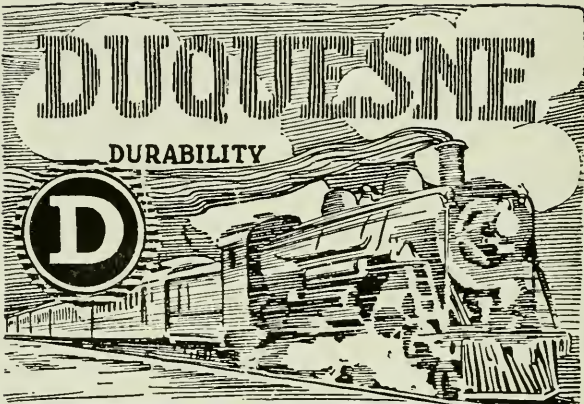
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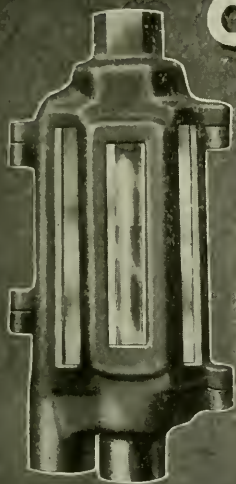
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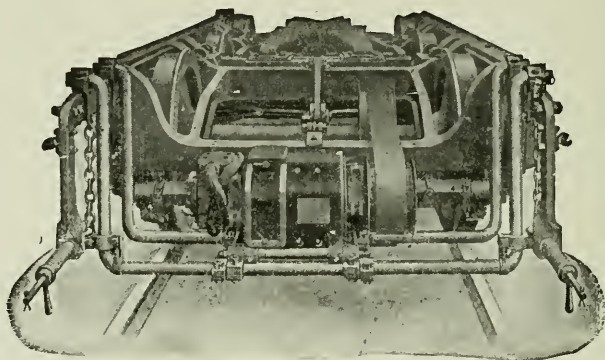
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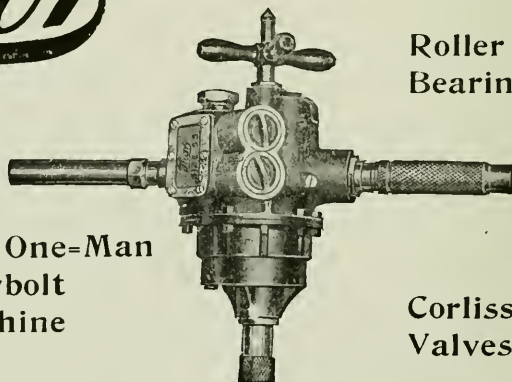
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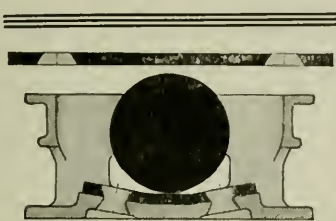
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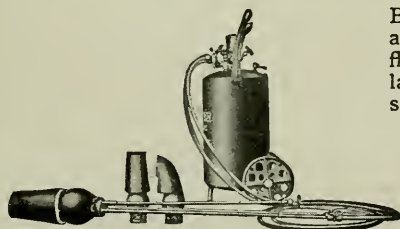
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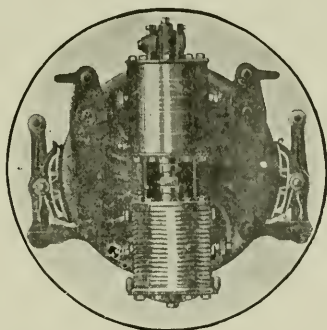
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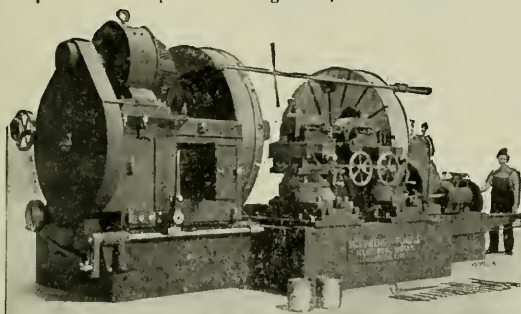
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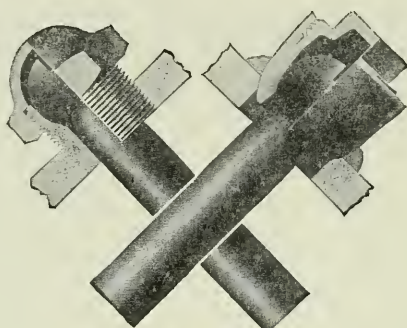
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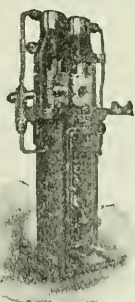
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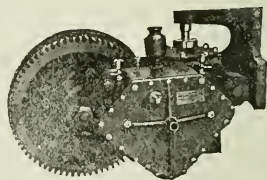


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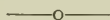
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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of September, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Discussion of the Railway Executives program upon the following subjects: 1. There should be an average daily minimum movement of freight cars of not less than 30 miles per day. 2. Freight cars should be loaded to an average of not less than 30 tons per car. 3. Bad order cars should be reduced to a maximum of 4% of the total number of cars owned. 4. There should be an early and substantial reduction in the number of locomotives unfit for service.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—Not received.

Richmond Railroad Club, F. O. Robinson, Secretary,
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary,
Union Station, St. Louis, Mo.

SUBJECT—"Manganese Construction in Track Work," by J. B. Strong, Chairman Standardization Committee, Manganese Track Society, Millburn, N. Y. "Methods of Standardizing Track Work," by Earl Stinson, Chief Engineer Maintenance, B. & O. R. R., Baltimore, Md.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—"Modernization of Locomotives," by C. M. Darden, Nashville, Tenn.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary, 95 Liberty Street, New York, N. Y.

SUBJECT—"The Upkeep of Freight Car Equipment," by J. W. Senger, Supt. of Rolling Stock of the New York Central Railroad (Lines West) at Cleveland, Ohio.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"Car Records and their Relation to Transportation and Accounting," by J. A. Altimas, Asst. General Supt. Car Service, Canadian Pacific Railway, Montreal, Canada.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"The Short Line Railroad in Logging Service," by C. A. Curtis, General Supt., California Western Railroad & Navigation Co. "The Short Line Mechanical Department," by W. A. Hesse, Master Mechanic, Ocean Shore Railroad Company.

Western Railway Club, A. F. Steubing, Secretary,
750 Transportation Building, Chicago, Ill.

SUBJECT—"The New Order of Things in the Railway World," by L. C. Fritch, Vice-President, C. R. I. & P. Ry.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—"Industrial Engineering," by Irving A. Berndt, Vice-President of the Society of Engineers of New York City.

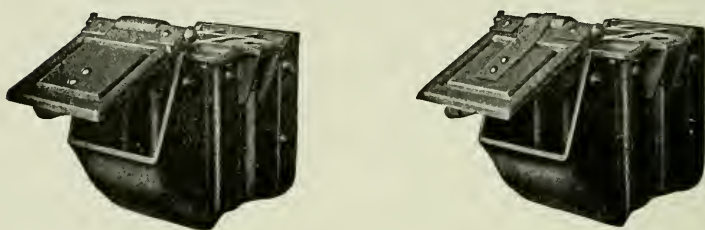
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Organized October 18, 1901.

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No. 8

Pittsburgh, Pa., Sept. 23, 1920

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Past Presidents

J. H. McCONNELL	October, 1901, to October, 1903.
L. H. TURNER	November, 1903, to October, 1905.
F. H. STARK	November, 1905, to October, 1907.
*D. W. WATTS	November, 1907, to April, 1908.
D. J. REDDING	November, 1908, to October, 1910.
F. R. McFEATTERS	November, 1910, to October, 1912.
A. G. MITCHELL	November, 1912, to October, 1914.
F. M. McNULTY	November, 1914, to October, 1916.
J. G. CODE	November, 1916, to October, 1917.
D. M. HOWE	November, 1917, to November, 1918.
J. A. SPIELMANN	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF MEETING

SEPTEMBER 23, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock P. M., President H. H. Maxfield in the chair.

The following gentlemen registered:

MEMBERS.

Allison, J. R.	King, J. W., Jr.
Amsbary, D. H.	Kummer, Jos. H.
Babcock, F. H.	Lanahan, J. S.
Batty, John	Laughner, C. L.
Berg, Karl	Laylin, M. H.
Bird, W. G.	Lent, John F.
Bonifield, C. P.	Lindstrom, Charles A.
Brant, Wm. J.	Lloyd, J. A.
Brower, J. E.	Lobez, P. L.
Christy, F. X.	Lynn, Samuel
Church, C. C.	Maxfield, H. H.
Clark, Harvey	Meeker, Harry B.
Collins, W. H.	Millar, C. W.
Crookston, W. G.	Moore, R. L.
Dambach, C. O.	Murphy, W. J.
Duffy, John F.	Myers, W. H.
Durkin, Jas. E.	McGrann, E. Roy
Eagan, J. T.	McNulty, F. M.
Emery, E.	O'Connor, M. J.
Eves, R. W.	Orchard, Chas.
Ferren, Robt. O.	Padfield, Archie
Forrest, C. H.	Patterson, J. E.
Freshwater, F. H.	Pehrson, Alf. K.
Frey, A. R.	Rhoads, G. A.
Fink, P. J.	Rick, Robert C.
Gobrecht, J. C.	Roth, P. J.
Gross, C. H.	Ruben, J. W.
Hale, Chas. E.	Sattley, E. C.
Hampson, Vance	Schaich, Wm. L.
Harris, John P.	Searles, E. J.
Heinemann, W. G. H.	Seiss, Wm. C.
Hornbeck, W. E.	Severn, A. B.
Howe, D. M.	Sewell, H. B.
Johnson, A. B.	Shaffer, Wm.
Jungbluth, Adolph	Smith, J. L.
Kelley, H. D.	Stauffer, A. H.
Kelly, Leo. J.	Stucki, A.

Tate, R. G.	Walter, W. A.
Taylor, H. G.	Walther, G. C.
Thomas, Maj. J. N.	Williamson, J. A.
Vowinkel, F. F.	Wolf, H. M.
Wright, John B.	

VISITORS.

Altman, C. F.	Kreiling, Wm. C.
Barker, N. M.	Mahan, W. C.
Belles, H. E.	Millar, R. J.
Berndt, Irwin A.	Moffitt, L. W.
Bhonof, J. A.	Moore, Wm.
Bruxh, C. C.	McGregor, S. S.
Cady, P. C.	Nicholas, A. D.
Chollman, E. L.	Patterson, H. W.
Erickson, B. D.	Rankin, N. W.
Fulton, Robert M.	Showalter, A. W.
Gallagher, F. S.	Snyder, P. H.
Gunnison, W. L.	Terry, A. C.
Hill, C. P.	Whitesides, H. P.

The call of the roll was dispensed with, the record of attendance being had through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Bradley, James A., Manager, Pittsburgh Machinery Co., 301 Jones Building, Pittsburgh, Pa. Recommended by J. D. Conway.

Bradley, James D., Apprentice, Pittsburgh Machinery Co., 1421 La Salle Avenue, Dormont Station, Pittsburgh, Pa. Recommended by J. D. Conway.

Brown, C. C., Representative, Dearborn Chemical Co., Apt. 14-12 McKinnie Street, Youngstown, Ohio. Recommended by D. H. Amsbary.

Cooper, C. E., T. M., Conemaugh Div., P. R. R., 204 Emerson Avenue, Aspinwall, Pa. Recommended by T. M. Blakely.

Elkin, W. L., Supt., P. R. R., 100 Penn Avenue, Pittsburgh, Pa. Recommended by T. M. Blakely.

Fahnestock, McClure, Asst. M. M., P. R. R., 5021 Bayard Street, Pittsburgh, Pa. Recommended by F. S. Robbins.

Faris, J. W., M. M., Youngstown Sheet & Tube Co., 421 Madison Avenue, Youngstown, Ohio. Recommended by A. Stucki.

Hartley, John G., Division Engineer, Penna. System, 6529 Shetland Avenue, Pittsburgh, Pa. Recommended by T. M. Blakely.

Hord, Peyton R., Pgh. Manager, American Engineering Co., 419 Oliver Building, Pittsburgh, Pa. Recommended by A. Stucki.

McClellan, Albert W., Division Supt., Penna. System, 77 W. Main Street, Uniontown, Pa. Recommended by H. H. Maxfield.

Snyder, P. H., Asst. Car Foreman, Montour R. R., 415 Mulberry St., Coraopolis, Pa. Recommended by P. J. Roth.

PRESIDENT: As soon as these applications have been approved by the Executive Committee the gentlemen will become members upon payment of the year's dues.

The Secretary read the report of the Nominating Committee for officers for the ensuing year as follows:

PRESIDENT

Frank J. Lanahan, President, Fort Pitt Malleable Iron Co., Pittsburgh, Pa.

FIRST VICE-PRESIDENT

Samuel Lynn, Master Car Builder, P. & L. E. R. R. Co., McKees Rocks, Pa.

SECOND VICE-PRESIDENT

D. F. Crawford, Vice-President, Locomotive Stoker Co., Pittsburgh, Pa.

SECRETARY

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PRESIDENT: The record of ballots will be forwarded by mail because it is understood any member of the Club is privileged to nominate any person for an office if he is not satisfied with the nominations of the Committee.

There being no further business, the paper of the evening was presented by Mr. Irving A. Berndt, Vice President of the Society of Engineers, of New York City upon the subject of "Industrial Engineering."

INDUSTRIAL ENGINEERING.

By Mr. I. A. Berndt of New York City.

Mr. Chairman and Members of the Railway Club:

Of course for me to talk to a Railroad Club on management principles presupposes that I know a lot about managing railways. And I do know all about it. I can tell you all about how to manage a railroad, because I am one of the traveling public, and whenever a train is an hour late, or we cannot get a lower, believe me, every man on the train can tell you how to manage that railroad.

I was talking to a friend the other day in New York. I told him I was going to Pittsburgh to address the Railway Club. He said "I feel sorry for you, they are a cold-blooded crowd," but when I came here this evening and met your Executive Committee, I found they were regular fellows, that they were honest-to-God men, probably all would like to see a baseball game, could tell a good story, or would take a drink—if they could get one.

So I am going to throw aside all isms and ologies, and talk, with your permission, some good sense, cutting out anything highbrow and keeping to something that might be eminently practical.

In considering the conditions throughout the country today, those of us who are making studies along production lines, and that is one of my particular functions as a member of the Society of Industrial Engineers, which is continually making researches and studies of production problems, are finding great problems in connection with production. We are finding it more and more difficult every day to get across the increased production per man or working hour necessary in this country. We have tried many means of getting this increased production, and the one we are most familiar with perhaps is that of money, higher wages, more money, but we have seen it gradually fail. So that at the present, since it is not a question of money, it must be something else.

We must get across a new understanding of what we will call practical economics; we have got to get across to

everybody concerned, down to the last worker, the idea that the wealth of the country is not money, but production; the wealth of the country being merely that production which is in excess of² what is needed. We have to get across to everybody in productive work, every productive worker of any kind, the idea that it is his acts, whether they be in distribution or in producing, that will make or change the economic condition of the country. In other words, it is a question of how much I produce, how much you produce, how much we use and how we use it. That briefly is the story that we have got to bring to our workers.

Now, if we accept the basis that we do need greater production per man or unit in many lines, then the next question is how can we reorganize to get it, and who is going to be responsible. I say to you gentlemen that the responsibility, the entire responsibility, lies not on capital nor on the worker, but on you and the men in your clubs, the managers of the country.

It has been for too long a time that whenever we talk of production or the general problems of the country, they are talked of in terms of capital and labor, just as if all you needed was a group of men and a lot of money to get full results. That third factor, Management, has not received the attention it should. Through the whole war there was a fundamental lack of the use of the management brains of the country. That was demonstrated when the Industrial Conference was appointed. Capital and labor was represented, and yet the representatives purely of the management brains of the country were not there.

The manager must establish that position, he must get himself accepted as a coordinate—accepted by both capital and labor. That is the job ahead. He must have a complete understanding accepted that he stands in the position where he knows the requirements of both. He should establish himself in a position where he refuses to take dictation from capital to do things which are not just and fair to labor. On the other hand, he should establish himself in a position where labor accepts him and has confidence in him to take care of their requirements. The method of doing that in-

volves a great number of new features, and involves particularly certain ideals.

I like to think of the manager more or less as a traffic cop. In other words, the man who directs the various factors having to do with production in such a way as to eliminate congestion. The thought has often come to me, particularly last year when we had 2100 strikes, in some cases capital accepting open warfare with labor, of just what would happen if the men who are managers were to go on a strike. If, in other words, you were to pull down the tops of your desks, lock up the doors and wait until labor and capital got together.

If you think of that for a minute, probably you will get the thought that I want to get across, that you have not established your status properly. You are not organized in this country, you are not as strong as you should be, you do not have the authority that you should have, and you are not recognized as the important third factor in the way that you should.

In the reorganization work there are certain ideals that should be established. If we are to get this greater production per unit, if we are to do the job of coordinating capital and labor, we must abide by certain rules and start with certain ideals. I will suggest three, and they are three of a great number, but to me they are the most important:

1. Service.
2. Human democracy.
3. Man building.

The first—service—is very important. I believe there is a great need to bring back that ideal into all activities. I think the ideal of service has been very much less through the war among workers; the ideal of service has been hidden in a great many cases under the ideal of the dollar. It has not been brought home and accepted by the worker that it is necessary to give service in proportion to the money that they get. Labor has lost sight absolutely, in many instances, of that ideal, and we must bring it back. I do not believe that the manager, or the young man of today who aspires to be a manager, goes to the great lengths that

he used to, to fulfill his ambition in the way of service. I believe that that ideal and the whole foundation underlying it must be readjusted and brought back in the strongest possible way, and that is your job. We must get across to the workers in terms of equivalencies the thought that if they are to get more or as much as they are getting now, there must be a proportionate increase in production. It does not mean driving, it means simply that we have got to get back to that ideal of getting close to the job, intensive management, intensive production.

As to human democracy, sometimes we hear it called industrial democracy. We have in this country three hundred different plans under which the workers take part in some way or another in the administrative activities of the company. There are committee plans of different kinds, plant councils, and a hundred and one different types of plans and combinations of them. The question does not lie so much in the plan, but in the spirit back of the plan, and the spirit with which it is accepted.

I know of a plant where a very complete plan of industrial democracy was outlined, they held regular meetings, and a speaker was requested and accepted an invitation to talk before their Club of Workers. About a week before this talk he was visited by the executive managers of that company, and when they spoke about the talk they said, "We have this industrial democracy plan and we have talks, but usually the speakers talk on a subject just a little bit above the men, and we recommend giving them something that goes over their head a little bit." The speaker refused and cancelled the invitation to speak. He told this executive group that in his opinion they were wasting all their efforts, because they had not been honest in their attitude toward the workers in taking up that work. Such a plan could never be a success if they did not have the right spirit and were not honest in their attitude toward the men.

So when we think in terms of that high ideal—human democracy—which is the ideal we must have in our future management plans, we must also think in terms of not the plan but the spirit back of it, the honesty and fairness with which we enter into it.

This ideal in a sense leads us to the third—man building. In this day and age it would hardly seem necessary to say much about man-building, and yet when we go around the country we find many places where it is absolutely lost. There is one outstanding feature in it and that is, that the responsibility for man building starts with the president of the company and runs down to the first man above the workers who has any executive or supervisory responsibility, and probably it is most important among the lowest of the supervisory groups. These men I like to think of as the contact bosses, I do not care what you call them, foremen, inspectors, superintendents, but the men who have contact particularly with the workers, these are the men who ought to be responsible for building men in your organization, and that building up must be done to a great extent by the influence you exert over them.

I like to think of any organization that is producing anything as not merely producing a product, but in the end producing good men, making contributions to the industrial field and to the great industrial productivity of the country in terms of men. I like to think of our men as not standing still, but growing from one organization problem into others, for that is the method with which to build them up.

And if we are going to coordinate, as I suggested in the first place, capital on the one side and labor on the other, as managers we must accept the idea of man building with a vengeance, because all of you seeking for supervisors, superintendents, foremen, or dealing with any of these grades, know they are the men who are the hardest to secure and to make.

With these three ideals there are certain things we must do in the way of establishing organization. We have at least four types of organizations that we deal with in management. The first is line, the second is functional, the third is line and staff, and the fourth is committee plans.

We started originally with line organization in which we established not functions, but positions. In other words, various men were responsible for various things, but there was a constant amount of overlapping and a great deal of duplication, with much misunderstanding in the straight line

organization. However, it did get results, because the line organization is primarily organized to do things. It got results, however, with a great deal of effort, sometimes at a great deal of expense. Still this line feature we must maintain always because after all, every organization is in existence to do things.

Dr. Frederick W. Taylor was probably the first man to recognize that we needed something in addition to line organization, and he established what is known today as functionalized organization in which he accepted the principle that some men were fitted to do certain things better than others, and he organized with specialists in supervision. In other words, some men were made foremen of men, other men were made foremen of machinists, other men foremen of tools, and his whole plan was to bring to bear the best talent he had on the various factors entering into production.

The next step in the progress of organization plans came through Harrington Emerson, who presented the principle that, besides doing things under either a functionalized plan or straight line plan, it was necessary to develop new things, to make researches, experiment, and so on. In other words, he outlined and established what was called staffs. That is not new in a number of applications, and I think probably in the railroad organizations it is found to be well established. However, in ordinary industrial organization it was not. He took the attitude that besides regular line organization, whether well functionalized as Dr. Taylor recommended or not, it was necessary to establish a staff. This staff took the work which had to do with new development, research, standardization, new inventions, and did it aside from the regular line, its position being such that it could be cut off without hurting the continuous productivity of the organization.

The fourth feature which comes up in organization is the committee plan and where it came from no one knows. Here, of course, the plan is to establish committees which will take charge of certain functions and will do certain phases of the administrative work. We all know that committees have never been successful in actual performance; in other words, we would not have a committee in charge

of a department. We might establish a committee which would develop certain designs, or the committee factor might be very useful in the solution of management problems of a general nature.

In the work of reorganization of our management policies, it is our duty to accept these four plans as possibilities and develop the right combinations. The industrial manager of today should make a study of those plans and then should make a study of his own organization to tie up enough of each to develop the best results. The industrial engineer of today does not contend that either one of these plans are best, but that they all have a use, and that the best organization plan comes from applying enough of each one of these four types to give your organization backbone, with men properly functioning, never standing still and a combination of the best brains applied on all problems.

With the plan of organization disposed of, there are certain rules that we ought to follow, certain principles that we ought to be guided by in our organization and management work.

I am going to give, with your permission, twelve principles that have been suggested, not that they are all or that they are the only ones, they merely suggest twelve principles that might well be followed by managers in handling their organization, and in the management of men no matter what the relationship is:

OBJECTIVE. Working up a tentative plan with reference to the ultimate development desired.

GREATEST COMPLICATION. The determination of the most complicated phases of the objective.

CONCENTRATION. Placing in each division of a business all of the factors which effect the performance of its own function.

INDIVIDUALISM. Placing in the hands of one man, most competent to handle the work, one or more functions or details of a business.

METAL CAPACITY. Dividing work in an organization, with reference to the knowledge and ability that will be

required of a man in charge of one or more functions or details of a business.

SPECIALIZATION. Dividing work so that a man may operate in limited fields rather than cover many diversified fields, in order that a few things may be done well rather than a large number superficially.

RESPONSIBILITY. Holding a man responsible for the total proven results he secures in his division or work and not for the details or methods that he uses in securing these results.

PERMANENCY. Training men to fill other positions than their own and providing for understudies so that changes in an organization may easily be made without disruption.

CROSS FERTILIZATION. Giving each pivotal man in an organization some opportunity during the year to know the methods of the departments his work influences mostly and of the departments which influence his work, as well as giving men different things to do to avoid monotony.

RELATIONSHIP AND INSTRUCTIONS. Providing a man with a clear-cut conception of the relationship existing between himself and those he is associated with, as well as with a written outline of duties, functions, responsibilities, results expected and methods affecting his work, or instructions covering his work.

PERSONNEL. Analyzing the requirements of given positions and finding men whose qualifications match the given requirements.

STAFF AND CONFERENCES. Creating an analytical and advisory body in an organization to cooperate with the executive, as well as a conference plan to make it difficult to determine where staff advice ends and line acceptance begins.

Next, we should think about the elements which we deal with in management. We classify them under six heads:

First. Investigation, because managers or foremen who have to deal with industrial problems cannot understand them unless they study them. Therefore this is considered an element.

Second. Coordination, the idea of cooperation in the solution of our problems.

Third. Records. Records are absolutely essential as an element of good organization. In this country today there are probably tons of paper used every day for useless records, and on the other hand there is a great lack of certain fundamental knowledge. Each of you have pet records, yet you know there are a lot of records made that you never look at. The application of records should be such that every single record is used, so that the test is use. If this is the ideal we will get better results from the records.

Fourth. Control, which means of course a schedule, planning our work and activities and always controlling production or any other phase dealt with.

Fifth. Standardization, and that has to do with doing the same thing in the right way each time, and not doing it in six different ways, five of which are inefficient. It means taking into consideration the best methods that can be found. Standardization does not mean perfection, but we do think these days of finding the one most acceptable or best known way.

The sixth is the most important element, that is—men. In our philosophy we keep coming back to the man question, and if we are asked as industrial engineers what is most important in our profession, we have but one answer. That we add the study of management of men in all of the other engineering activities applying the brains and energy of men and coordinating them with all other natural energies and resources in production.

Now taking up a little bit more than the allotted time, with your permission, I would like to read some factors which have been developed as having to do with industrial relations and to draw a few conclusions from them.

Let me outline the scope of the problem as I have analyzed it.

First, let us consider who influences industrial relations, as follows:

1. Administrative Executives.
2. Operating Heads.
3. Immediate Superintendents and Foremen.
4. Fellow Workers.

Next, let us consider in detail what influences these relationships, and we have twenty-four influences, namely:

1. Selection of men for definite task.
2. Assignment of men to their work.
3. Methods of instruction.
4. Rules and regulations.
5. Methods in use.
6. Tools provided.
7. Equipment and facilities furnished.
8. Condition of buildings.
9. General surroundings.
10. Supervision.
11. Planning of work for men.
12. Standards of performance.
13. Records of performance.
14. Hours of work.
15. Plan of wage payments.
16. Incentives.
17. Safety of working conditions and facilities.
18. Plant comforts and aids.
19. Effect of conditions on work and health.
20. Educational opportunities.
21. Amusement opportunities.
22. Recreation.
23. Community interests.
24. Management policies.

How industrial relations can be influenced can next be analyzed as follows:

1. Personal contact and conversation.
2. Bulletins.
3. Verbal or written instructions.
4. Things seen.

5. Criticisms or praise.
6. Physical influences.
7. Mental influences.
8. Material or monetary reward.

From an analysis and a careful consideration of it, certain features have presented themselves so emphatically that they become almost stupendous in their effect upon the imagination.

First, of the four types who influence relationships—three are management, and but one, the workers. Of the twenty-four factors which influence relationships, only four—methods in use, general surroundings, safety of working conditions and facilities, and community interests, as given above, are wholly or partially controlled by the worker; all the others being a definite responsibility of the management.

Of the eight methods by which industrial relationships can be influenced, only two, personal contact and conversation, and things seen, can be partially controlled by workers.

To me, this analysis presents the most conclusive evidence that all responsibility for proper industrial relations lies with the management and that all the initiative and improvement of these conditions must emanate from the management.

Another rather interesting analysis is this—of the twenty-four factors which influence relationships, only two have to do with money and compensation, and of the eight methods by which it is influenced, only one has to do with a monetary reward. Does this not make us stop for a minute and consider just how important money is, or how little its complete effect may be after all? Incentives of money are important, of course, but since making this analysis there has been growing with me an impression that maybe we have been permitting the money factor to eclipse some of the other more basic features, by which our relations are controlled, and this is easily an error of both the employer and employe.

The relationship between such employers and men can well be likened to the dealings among the money-changers of yore, each one shrewdly bargaining, giving as little as

possible for that which they received, and attempting to secure more and again more for that which they gave.

An industrial plan of any permanency and stability can no more be established on such basis than could the financial stability of nations and the world be established on the principles followed by those ancient financiers.

When we talk about the man problem of course we start the entire discussion of what are we going to do with the man who won't cooperate, and we begin to blame the workers. I have only one answer to that, and that is, teach them how to cooperate; it is your job; don't expect them to do it of their own accord. We hear a good deal about Bolshevists and Bolshevism, and direct action, which in other terms means force, and I contend and recommend direct action on the part of managers, but my term direct action means education, getting right down to the man himself.

I have been fortunate in finding two very good instances of this. I was in the office of the president of one of the biggest manufacturers in Detroit. In this particular industry there has been a lot of labor trouble, but this big company never had any. I asked the president why and he pointed to the door of his office and said it is always open for the men to come to him and for him to go to the men. He said "I can go through the plant and I know my men, I can call them by name. I usually know when Jim is going to have a new baby, I know something about their interests."

He said if the whole crowd came to him tomorrow and wanted a ten per cent increase, he would give it to them. If he could not afford to do it he would get them all together and lay all the cards on the table, and he was willing to bet there would not be one who would not come across.

Another instance which is almost dramatic occurred in Illinois. I was going through a pottery plant talking over a number of things with the president of the company. I told him there was one thing which struck me as very marked—the very good spirit among the men, the fine labor conditions. When I went through the plant with him I noticed he talked to one man and said "Where is your partner?" and the worker replied "Why, he is out starting a garden today." "Well, that is fine," he said. He talked

to another fellow and said, "How is your mother today?" To one little Italian fellow he said, "Jim, I don't want you to work too hard." He told me Jim had been in a Reform School, and was going from bad to worse, the son of one of his Italian workers who wanted to get employment for him. He told him to bring the boy in and he would put him to work. The father said "I will have him work for nothing," but the president said "No, he will be taught to produce."

In other words, he was in close touch with his men, and had a force of something over 300. After returning to his office I complimented him upon the good relations with his workers and he gave me to understand this was his hobby.

Later, talking with one of the other members of his firm I was told the following story which impressed me as being one of the most dramatic instances of highly developed industrial relations with which I had ever come into contact.

The president of this company became seriously ill with influenza just at the time when he was building some additions to his plant and improving his present facilities, including working conditions.

After three physicians had advised that he could not live during the night of the crisis, he concentrated his entire will-power on the thought that he must live because he must finish the plant and provide better conditions for his men. In other words, he felt an extreme responsibility to his workers, saying from time to time, aloud, "I must live—they need me." In a room just outside of that in which he was lying prostrate, three of his workers during the crisis spent the night on their knees praying to God for the recovery of the president of their company. One of these was a big "buck" nigger, a second an old Italian worker, and the third, a young American workman.

It is hardly necessary to add that this man did recover and that with the spirit indicated he can go through his business career joyfully and happily fulfilling his great desire to develop a better group of workers and serve them, receiving from them a full degree of cooperation.

If I were to leave any one message with you, whether you are dealing with one man or twenty thousand men, the

thought I want to bring is that the solution of the problem is in the hands of you men who deal with and supervise other men, and if you are going to get the best results use direct action, get to the men, teach them how to cooperate. That is your job. These other features, the principles we have talked about and the types of organization, no matter what the philosophy back of them, none of them are effective unless you get directly to the men. We could talk for hours, I dare say, about the various plans, methods and records, all of which are necessary, but underlying the whole thing is the necessity of dealing with the men, because that is the one problem for which we have no rules or measuring tapes. If you don't deal with it, if you don't handle the man proposition, the man proposition is going to try to handle you, and may succeed.

If you anticipate, as you can, the requirements of your workers, of the men in your organization, you will not be forced to do unreasonable things. I know from personal contact scores of cases where this has been proven. A steward, for instance, in a union organization, offered to repudiate his organization if I would give his group certain conditions that I had given other men, not members of a union. He was simply coming to the place where he could get the best conditions. After all, we must get this idea into the management problem among the managers and the foremen, to develop the right interest and the right understanding there, and then through them deal with the men.

There is a great movement throughout the country along these lines. In Cleveland there is an industrial association composed of some 3000 foremen, who meet regularly and discuss these phases and the things they are doing to develop a better understanding of men, the handling of men and their selection, and all the other phases that go with it and they are going to get great results. There are similar associations in Chicago and Philadelphia, and some other places.

I think probably my enthusiasm about this particular subject has led me to talk longer than I should. My excuse is simply that it is a big subject.

I want to do a little press agent work for a play I recently saw in New York, when it comes here you should

all see it—"Poldekin" by Booth Tarkington. It is a story of Bolshevism. In it an attempt is made to bring Bolshevism to this country and the story can be told very simply in the fact that it was your type of Americanism that in this play made Bolshevism impossible, and that is the kind of Americanism you must get into industries, it is the feeling of right interest toward the men, toward the workers, a feeling of good fellowship and humane interest, respect and consideration. When we bring that kind of Americanism into industry, we will have nothing to fear from Bolshevism, or any other harmful isms.

PRESIDENT: This has been a very interesting and timely talk, and I wish to express to Mr. Berndt the sincere thanks of the Club for his very able address on a subject which is of extreme importance to every one in any way connected with industrial engineering.

Government Moving pictures on the "Story of Oil" were then shown which proved very interesting.

There being no further business, the meeting upon motion adjourned.

J. D. CONWAY, Secretary.

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Compiled by the Society of Railway Club Secretaries

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Secretary

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- October 17, 1919.—“Freight Car Utilization,” by Mr. Warren C. Kendall, Mgr., Car Service Section, U. S. R. R. Administration.
- November 21, 1919.—Annual Electrical Night.
- December 19, 1919.—“The Industrial Conflict,” by Mr. William L. Chenery.
- January 15, 1920.—Annual Dinner.
- February 20, 1920.—“The Return of the Railroads,” by Mr. James H. Hustis, Pres., B. & M. R. R.
- March 19, 1920.—“The Automatic Train Control Problem,” by Mr. H. S. Balliet, Signal Engineer, Electric Division, N. Y. C. R. R.
- April 16, 1920.—“Increasing the Efficiency and Operating Capacity of Steam Locomotives,” by Mr. B. B. Milner, Engineer of Motive Power and Rolling Stock, N. Y. C. R. R.
- May 21, 1920.—“Railway Conditions in Foreign Countries,” by Mr. J. B. Risque, of the Railway Age.
Mr. A. J. Baldwin, Vice-Pres., McGraw-Hill Publishing Co.

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Harry D. Vought, 95 Liberty Street, New York City
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- January, 1920.—“Preparation of the Locomotive at Engine Houses and Shops and its Relation to Fuel Economies,” by Leslie R. Pyle, Supervisor Fuel Conservation Section, Division of Operation, U. S. R. R. Administration.
- February, 1920.—“Electric Arc Welding,” by W. M. B. Brady, Commercial Engineer, General Electric Co.
- March, 1920.—“The National Agreement with Shopmen,” by Frank McManamy, Manager Dept. of Equipment, U. S. R. R. Administration.
- April, 1920.—“Modern Methods of Reducing Cost of Locomotive Repairs,” by S. W. Mullinix, Supt. Shops, C. R. I. & P. Ry.
- May, 1920.—Annual Meeting.

NEW ENGLAND RAILROAD CLUB

Wm. E. Cade, Jr., 683 Atlantic Avenue, Boston, Mass.
Secretary

- October 14, 1919.—“Shop Efficiency,” address by Frank McManamy, Assistant Director, Division of Operation, United States Railroad Administration.
- November 18, 1919.—“Economy of Stationary Power Plants,” address by C. A. Brandt, Mechanical Engineer, Locomotive Superheater Company.
- December 9, 1919.—“Operation of Railroad Terminals, New York Terminal District,” address by J. J. Mantell, Terminal Manager, New York Terminal District, United States Railroad Administration.
- January 13, 1920.—“Steel Specifications,” address by F. A. Weymouth, Sales Metallurgist, Bethlehem Steel Company.
- February 10, 1920.—“Handling of Purchases and Supplies,” address by E. J. Roth, Manager Stores Section, Department of Purchases, United States Railroad Administration.
- March 9, 1920.—Thirty-seventh Annual Meeting. Election of Officers and Reports, together with Annual Entertainment.
- April 13, 1920.—“Economics of the Freight Train Load,” address by William J. Cunningham, Professor of Transportation, Harvard University.

May 11, 1920.—"Responsibilities of Supervisory Officers in the Maintenance of Way Department," address by W. J. Backes, Engineer Maintenance of Way, N. Y. N. H. & H. R. R.

ST. LOUIS RAILWAY CLUB

**B. W. Frauenthal, Drawer 24, M. & P. O., St. Louis, Mo.
Secretary-Treasurer**

May 9, 1919.—"The Operation of Federalized Railways Under War Conditions," by Carl R. Gray, formerly Director of Operation, U. S. R. R. Administration, Washington, D. C.

June 13, 1919.—An Appreciative Service.

July 11, 1919.—An Appreciative Service, continued.

August 8, 1919.—An Appreciative Service, continued.

September 12, 1919.—"Railroad Reorganization in the Interest of Public, Owners and Employes," by Doctor William G. Raymond, Dean of the College of Applied Science of the State University of Iowa.

October 10, 1919.—"Can the Railroad Problem Be Solved?" by Samuel O. Dunn, Editor of the Railway Age, Chicago, Ill.

November 14, 1919.—"Fuel Economy and Locomotive Operation," by Robert Collett, Assistant Manager, Fuel Conservation Section, Division of Operation, U. S. R. R. Administration, Grand Central Station, New York, N. Y.

December 19, 1919.—"Cummins Bill for the Readjustment of the Railroad Problem," by Hon. Genophen P. Wilfley, ex-United States Senator from Missouri.

January 16, 1920.—"Idealism in Business," by the Rev. Z. B. T. Phillips, Rector St. Peter's Episcopal Church, St. Louis, Mo.

February 20, 1920.—"Scientific Methods in Employment Management," by Edgar James Swift, Professor of Psychology and Education, Washington University, St. Louis, Mo.

March 12, 1920.—"The Baldwin Locomotive Works," by Arthur S. Goble, St. Louis Representative, The Baldwin Locomotive Works in St. Louis, Mo.

April 16, 1920.—"The Bituminous Coal Industry and the Public," by Eugene McAuliffe, President and General Manager, Union Colliery Company, St. Louis, Mo.

CANADIAN RAILWAY CLUB

**W. A. Booth, 131 Charron St., Montreal, Que.
Secretary**

May 13, 1919.—Annual Meeting, also List of Members, Constitution and By-Laws.

September 9, 1919.—Paper and Discussion on "Why is a Hot Box," by Mr. E. J. McVeigh, General Storkeeper, Grand Trunk Railway, Montreal, Que.

October 14, 1919.—Lecture and Discussion on "Competition, Combination and Co-operation," by Major S. P.

Robins, General Manager, Dearborn Chemical Co. of Canada.

November 9, 1919.—Paper on "Terminal Power Plants," by Mr. W. J. Harding, Chief Engineer, Ottawa Power Plant, Grand Trunk Railway, Ottawa.

December 9, 1920.—Moving Picture Demonstration on "Safety First and First Aid to the Injured," by Mr. E. E. Stevens, Safety Engineer, Canadian National Railway, Moncton, N. B.

January 13, 1920.—Paper and Discussion on "Graphic Power Control," by Mr. E. T. Spidy, A. M. A. S. M. E., Production Engineer, Canadian Pacific Railway, Angus Shops, Montreal.

February 10, 1920.—Paper and Discussion on "Thermit, Electric and Acetylene Welding," by Mr. W. H. Ludington, Manager Davis Bournonville Co., Montreal.

March 9, 1920.—Paper and Discussion on "A Few General Observations on Locomotive Valve Motion," by Mr. F. Williams, Mechanical Designer, Canadian National Railways, Moncton, N. B.

April 13, 1920.—Paper on "Freight Car Roofs," by Mr. H. R. Naylor, Asst. Works Manager, Car Dept., Canadian Pacific Railway, Angus Shops, Montreal, Que.

THE RAILWAY CLUB OF PITTSBURGH

John D. Conway, 515 Grandview Ave., Pittsburgh, Pa.
Secretary

September, 1919.—"Economic Disposal of Waste Material," by C. H. Clark, President of the Clark Car Co., Pittsburgh, Pa.

October, 1919.—Annual Meeting, Election of Officers and Entertainment.

November, 1919.—"Mechanical Firing of Locomotives," by D. F. Crawford, Vice-President of the Locomotive Stoker Co., Pittsburgh, Pa.

December, 1919.—"How Pneumatic Tools are Made," by H. S. Covey, of The Cleveland Pneumatic Tool Co., Cleveland, Ohio.

January, 1920.—"Express Transportation," by D. W. Gibson, Supt. of the American Railway Express Co., Pittsburgh, Pa.

February, 1920.—Afternoon Visit to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to inspect one of the New Modern Types of Electric Locomotives. Evening, "The New Baldwin-Westinghouse, Chicago, Milwaukee & St. Paul, Electric Locomotives," by N. W. Storer, General Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

March, 1920.—"Development of the Locomotive," by E. Converse Peirce, Pittsburgh Manager of the Baldwin Locomotive Works.

April, 1920.—"Coal Mining and Transportation," by J. W. Paul, Chief Coal Mining Engineer of the Bureau of Mines, Pittsburgh, Pa.

May, 1920.—“France and America,” by Hon. William Graves Sharp,
Ex-Ambassador to France.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB

**A. J. Merrill, Secretary, P. O. Box 1205,
Atlanta, Ga.**

September, 1919.—“Sufficient and Efficient Lubrication of Superheat Locomotives,” by P. H. Conradson, Consulting Chemist, Galena Signal Oil Co., Franklin, Pa.

November, 1919.—“Handling Heavy Tonnage Trains,” by Robert Burgess, Westinghouse Air Brake Company.

January, 1920.—“Conditions of Journal Bearings as Affecting Efficient Operation,” by W. J. McGee, Galena Signal Oil Co.

March, 1920.—“Fuel Oil as Applied to Locomotives,” by Geo. A. Miller, S. M. P., Florida E. C. Ry., St. Augustine, Fla.

May, 1920.—“Electric Welding,” by H. P. Miller, Wilson Welder & Metals Co., Brooklyn, N. Y.

THE ANNUAL MEETINGS OF THE SOCIETY ARE HELD IN
CONNECTION WITH THE CONVENTIONS OF THE

MECH. DIV., AMERICAN RAILWAY ASSOCIATION

Chairman, W. E. Cade, Jr., New England Railway Club

Vice-Chairman, W. A. Booth, Canadian Railway Club.

Secretary-Treasurer Harry D. Vought, New York Railroad and
Central Railway Clubs, New York City

SOCIETY OF RAILWAY CLUB SECRETARIES

Abstract of Minutes of Annual Meeting.

At Atlantic City, June 11, 1920.

The Society of Railway Club Secretaries met in annual session June 11, 1920, at the Marlborough-Blenheim Hotel, Atlantic City, N. J., Mr. William E. Cade, Jr., of the New England Railroad Club of Boston, Mass., Vice-Chairman, presiding in the absence of the Chairman, Mr. A. J. Merrill of the Southern & Southwestern Railway Club, Atlanta, Ga., who had advised that he was convalescing from an attack of Flu and could not attend.

The meeting had been preceded on Thursday by a round table luncheon at the same hotel. The guests of the Society on that occasion included Mr. Daniel M. Brady, of New York, founder of the Society; Mr. H. C. Manchester, President, New York Railroad Club; Mr. D. W. Pye, Treasurer, New York Railroad Club and Chairman of the Finance Committee of the Central Railway Club; Mr. J. E. Fairbanks, General Secretary and Treasurer of the American Railroad Association; Mr. Roy V. Wright, Chairman, Committee on Subjects, New York Railroad Club; Mr. W. H. Winterrowd, President, Canadian Railway Club of Montreal, and Mr. G. M. Wilson, Superintendent of Motive Power, Grand Trunk, Montreal, and a member of the Auditing Committee of the Canadian Railway Club.

At the business session on Friday, members present in addition to Mr. Cade were:

Mr. Harry D. Vought, Secretary, New York Railway Club, Secretary-Treasurer, Central Railway Club.

Mr. W. A. Booth, Secretary, Canadian Railway Club.

Mr. John D. Conway, Secretary, The Railway Club of Pittsburgh.

On motion of Mr. Booth it was decided to waive any assessment upon the Clubs for the ensuing year, it being agreed that if the Society should be in need of funds, it could sell its Liberty Bond, the Secretary-Treasurer being authorized in such event to do so.

Following a suggestion from the Secretary, an agreement was reached to broaden the scope and usefulness of the Society with a view to the organization of a new Association whose membership should be limited to Secretaries of railroad organizations. This was dependent upon the idea appealing to the absent members of the Society. If it met with their approval the Secretary-Treasurer was authorized to prepare the necessary amendment to the Constitution and By-Laws of the Society to conform to this action, a meeting of all interested to be held later for the purpose of putting the proposition into effect.

The consensus of opinion was that the plan contemplated would be conducive not only to the benefit of the present members of the Society but ultimately be advantageous to the organizations they represent.

The Secretary-Treasurer was instructed to convey to Mr. J. E. Fairbanks, General Secretary of the American Railway Association, an expression of high appreciation of the thoughtfulness which led to the big innovation in connection with the annual meetings of the Mechanical Division of his Association in providing a place and facilities for the handling of correspondence, etc., for members or their representatives.

Also to say that in all probability this feeling would be so substantially shared by all present at the meetings in question, that its perpetuation would be assured and it would be made an important

feature of these annual assemblages, especially in view of the saving of time assured and the convenience afforded.

An understanding was reached which is expected to result in making more complete each month the announcement of papers and authors before each of the railroad clubs which has been carried in their respective Proceedings with a view to affording members of Clubs accurate and the earliest information possible as to these matters.

The Secretary-Treasurer, as usual, was directed to compile a complete Index of papers and authors having the attention of the various Clubs during the nine months ended May, 1920, for publication with an abstract of these Minutes of the annual meeting of the Society in the September official Proceedings of each Club.

The Secretaries devoted much time to exchange of suggestions, methods and practices as a result of which they were able to give each other new ideas calculated to promote increased efficiency and the concrete and prompt handling of Club affairs with which they are entrusted under the direction and supervision of members of their respective Executive Committees.

Officers were elected for the ensuing year as follows:

Chairman, Mr. William E. Cade, Jr.

Vice-Chairman, Mr. W. A. Booth.

Secretary-Treasurer, Mr. Harry D. Vought.

This completing the business before the Society the meeting adjourned subject to any future call.

Respectfully submitted,

HARRY D. VOUGHT,
Secretary-Treasurer.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIR-
CULATION, ETC., REQUIRED BY THE ACT OF
CONGRESS OF AUGUST 24, 1912,

Of Official Proceedings—Railway Club of Pittsburgh, published monthly except June, July and August, at Pittsburgh, Pennsylvania, for October 1, 1920.

State of Pennsylvania, }
County of Allegheny, } ss.:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. D. Conway, Secretary, who, having been duly sworn according to law, deposes and says that he is the Editor and Publisher of the Official Proceedings—Railway Club of Pittsburgh, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations.

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Official Proceedings—Railway Club of Pittsburgh.
Editor, J. D. Conway, 515 Grandview Avenue, Pittsburgh, Pa.
Managing Editor, J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa.
Business Manager, J. D. Conway, 515 Grandview Ave., Pittsburgh.

2. That the owners are:
President, H. H. Maxfield, Pittsburgh, Pa.
Vice-President, Frank J. Lanahan, Pittsburgh, Pa.
Secretary, J. D. Conway, Pittsburgh, Pa.
Treasurer, F. H. Stark, Pittsburgh, Pa.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or their securities are:
NONE.

J. D. CONWAY, Secretary.

Sworn to and subscribed before me this 25th day of September, 1920.

SUE B. FRITZ,
Notary Public.

[Seal.]
(My commission expires February 21, 1923.)

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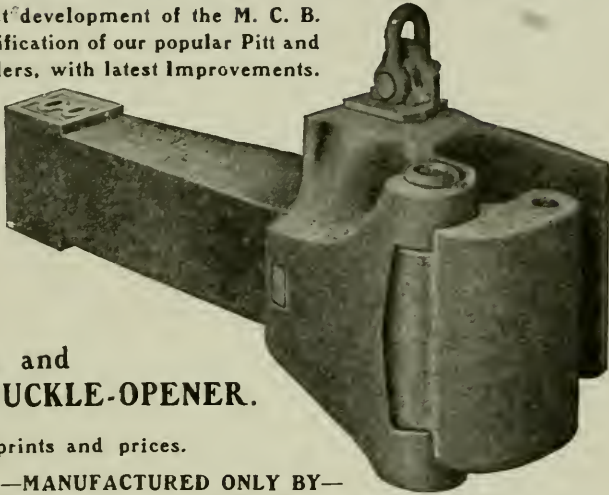
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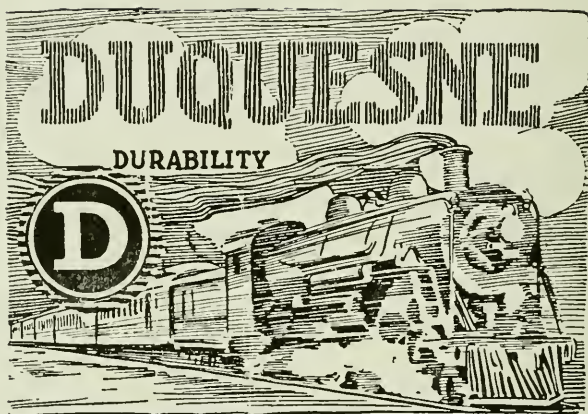
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No. 9.

ANNUAL MEETING — ELECTION OF OFFICERS NAMES OF MEMBERS

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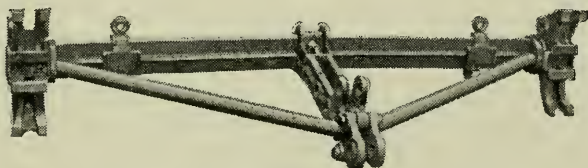
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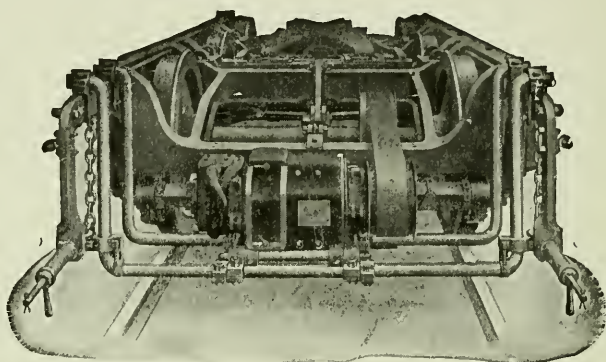
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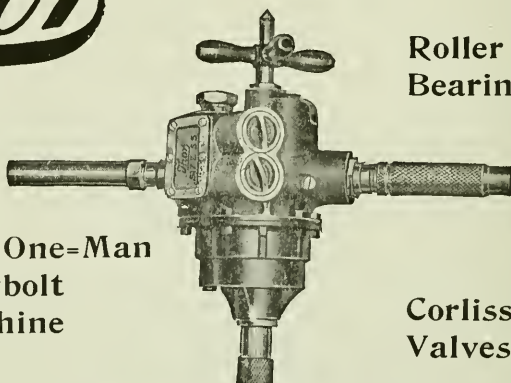
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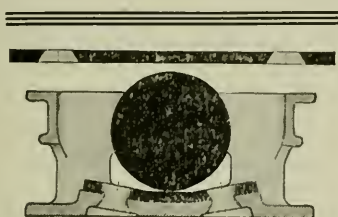
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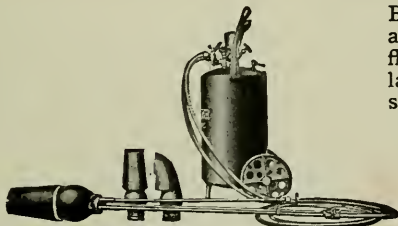
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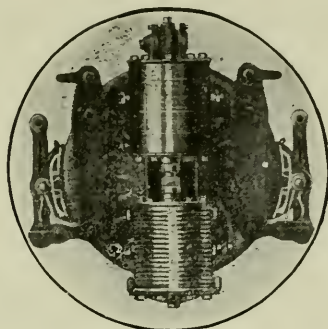
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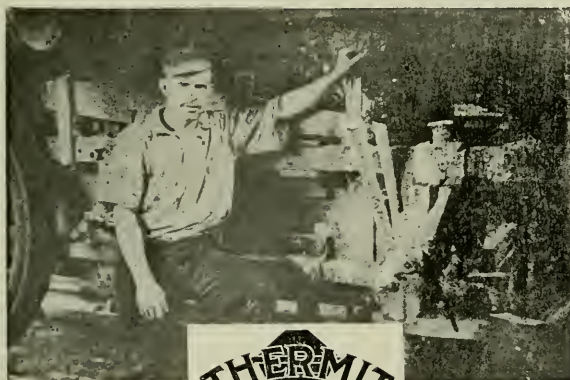
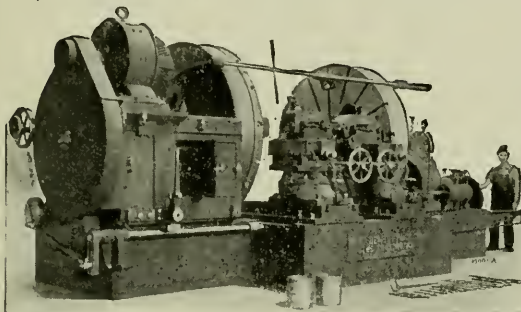
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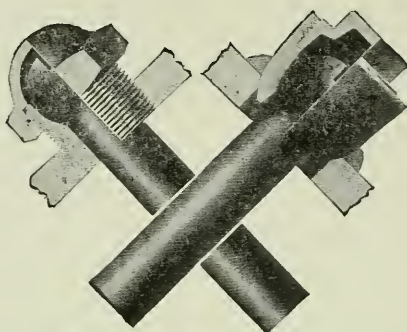
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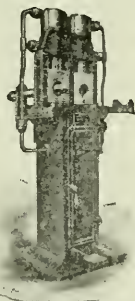
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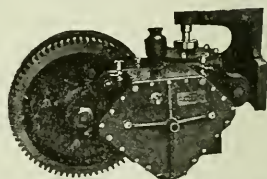


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RAILWAY CLUB NOTES.

The following subjects were presented and discussed by the several Railway Clubs during the month of October, 1920, as noted below:

New York Railroad Club, Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—"The Human Element in Railroading," by William S. Wollner, General Safety, Fire Prevention and Welfare Agent of the Northwestern-Pacific R. R., and Secretary of the Pacific Railway Club of San Francisco, Cal.

New England Railroad Club, Wm. E. Cade, Jr., Secretary,
683 Atlantic Avenue, Boston, Mass.

SUBJECT—"The Recent Increase in Passenger and Freight Rates and Its Relation to the Public," by Gerrit Fort, Vice-President Boston & Maine R. R.

Richmond Railroad Club, F. O. Robinson, Secretary.
Richmond, Va.

SUBJECT—Not received.

St. Louis Railway Club, B. W. Frauenthal, Secretary.
Union Station, St. Louis, Mo.

SUBJECT—"Central Western Manufacturing Industry in Relation to Transportation Conditions," by R. D. Sangster, Industrial Commissioner, St. Louis Chamber of Commerce.

Southern & Southwestern Railway Club, A. J. Merrill, Secretary,
Box 1205, Atlanta, Ga.

SUBJECT—Not received.

Central Railway Club, Buffalo, N. Y., Harry D. Vought, Secretary,
95 Liberty Street, New York, N. Y.

SUBJECT—Not received.

Canadian Railway Club, W. A. Booth, Secretary,
131 Charron Street, Montreal, Canada.

SUBJECT—"Patents of Invention," by William P. McFeat, Patent Attorney of Montreal.

Pacific Railway Club, Wm. S. Wollner, Secretary,
64 Pine Street, San Francisco, Cal.

SUBJECT—"The Need for More Transportation and How to Provide It," by K. M. Nicoles, Chairman Car Service Committee, American Railroad Association and Gen. Car Service Agent, Northwestern Pacific R. R.; and Hal M. Remington, chairman of the Interstate Commerce Commission's Terminal Committee and Asst. Mgr. Traffic Bureau, San Francisco Chamber of Commerce.

"The Railroad Man's Viewpoint," by G. W. Lupton, Supt. of Terminals, Atchison, Topeka & Santa Fe Railway Company.

Western Railway Club, Bruce V. Crandall, Secretary,
1824 Lytton Building, Chicago, Ill.

SUBJECT—"We Have the Public's Confidence. How Did We Get It and How Are We Holding It?" to be handled from the equipment standpoint, by A. W. Towsley, Asst. Vice-President and Gen. Mgr. Chicago, Rock Island & Pacific Railway; and handled from the operating end by F. H. Hammill, Asst. Gen. Mgr. Chicago & Northwestern Railway.

The Railway Club of Pittsburgh, J. D. Conway, Secretary,
515 Grandview Avenue, Pittsburgh, Pa.

SUBJECT—Annual Smoker and Election of Officers.

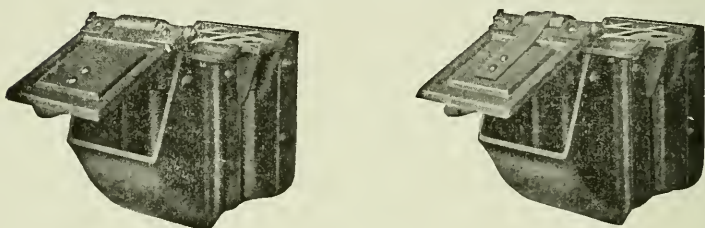
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No. 9

Pittsburgh, Pa., Oct. 28, 1920

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J. G. CODE.....	November, 1916, to October, 1917.
D. M. HOWE.....	November, 1917, to November, 1918.
J. A. SPIELMANN.....	November, 1918, to October, 1919.

*Deceased.

Meetings held fourth Thursday of each month, except June, July and August.

PROCEEDINGS OF ANNUAL MEETING OCTOBER 28, 1920.

The meeting was called to order in the Americus Club House, Pittsburgh, Pa., at 8 o'clock, P. M., President H. H. Maxfield in the chair.

The following gentlemen registered:

MEMBERS.

Adam, L.	Cunningham, J. L.
Allison, J. R.	Cunningham, R. I.
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Babcock, F. H.	DeCoudres, R. B.
Battenhouse, J. M.	Devans, E. J.
Bell, R. P.	DeVilbiss, E. B.
Berg, K.	Dickinson, F. W.
Berghane, A. L.	Donaldson, G. C.
Bihler, L. C.	Durant, Chas. H.
Blackall, R. H.	Durkin, Jas. E.
Boate, H. S.	Eagan, J. T.
Bonifield, C. P.	Easton, J. McF.
Bowden, T. C.	Emery, E.
Bradley, W. C.	England, Alex.
Brandt, W. L.	Eves, R. W.
Brant, Wm. J.	Fink, P. J.
Brower, J. E.	Forrest, C. H.
Browne, Bard	Freshwater, F. H.
Buffington, W. P.	Frey, Albert R.
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Carroll, F. E.	George, Miles E.
Chalker, A. R.	Gilg, Henry F.
Charlton, Wm.	Grady, Jos. H.
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Christy, F. X.	Gross, Chas. H.
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Conway, J. D.	Hindman, S. M.
Copeland, T. T.	Hoffman, C. T.
Crawford, D. F.	Hornbeck, W. E.
Crenner, J. A.	Howe, D. M.
Cromlish, W. L.	Huber, H. G.
Crookston, W. G.	Huchel, Wm. J.
Cunningham, H. R.	Johnson, A. B.

Johnson, E. A.	Padfield, Archie
Jones, L. E.	Painter, Joseph
Jungbluth, Adolph	Parke, F. H.
Kelly, H. B.	Pehrson, Alf. K.
Kelly, Leo J.	Perkins, Chas. F.
Keptner, J. B.	Proft, John W.
Kimes, L. R.	Prosser, C. S.
Kinch, L. E.	Prouty, E.
Kindle, W. F.	Rea, C. S.
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King, J. W., Jr.	Redding, R. D.
Kinter, D. H.	Reed, C. R.
Koch, Felix	Reich, F. C.
Krepps, T. S.	Reynolds, D. E.
Kummer, Jos. H.	Rhoads, G. A.
Lanahan, Frank J.	Rick, Robert C.
Lanahan, J. S.	Robbins, F. S.
Lang, W. C.	Roth, Philipp J.
Laughner, C. L.	Saxer, Harry
Laurent, G. F.	Schaich, Wm. L.
Lindstrom, Charles A.	Searles, E. J.
Lobez, P. L.	Seibel, E. L.
Long, R. M.	Seibert, Wm. L.
Lower, N. M.	Seiss, Wm. C.
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Lynn, Wm.	Sheridan, T. F.
Matchett, H. K.	Showalter, A. W.
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Miller, S. W.	Snyder, W. H.
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Murphy, W. J.	Stark, F. H.
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 Fox, A. B.
 Gammieri, E. J.

Gardner, Geo. R.
 Gemerodt, O. C.
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 Gillen, J. B.
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 Heinz, Howard E.
 Hepeen, V. L.
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 Montgomery, M. T.
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 Record, J. F.
 Reeve, Geo.
 Reblin, T. G.
 Reblin, Walter C.
 Renshaw, W. B.
 Risch, Elmer E.
 Rogers, John W.

Ryan, W. D.
 Schmid, Wm. L.
 Schmied, Fred J.
 Shannon, David E.
 Shouraft, J. W.
 Sines, Geo. H.
 Sittler, Karl A.
 Snyder, R. F.
 Stewart, L. S.
 Sturmer, V. L.
 Strohmer, J. L.
 Sushinski, Chester
 Walker, J. W.
 Weaver, C. H.
 Weaver, Earl H.
 Werner, Edw. C.
 White, W. W.
 Williams, R. A.
 Wolford, R. S.
 Yeager, J.
 Zimmer, G. H.

The call of the roll was dispensed with, the record of attendance being had through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Anderson, James W., Manager of Pneumatic Tool Sales, Ingersoll-Rand Co., 706 Chamber of Commerce Bldg., Pittsburgh, Pa. Proposed by T. E. Forbes.

Arenth, Leo Henry, Clerk, Pennsylvania System, 308 Sixth Street, Sharpsburg, Pa. Proposed by H. G. Huber.

Barnhart, S. Elmer, Clerk, P. & L. E. R. R., 108 Fifteenth Street, S. S., Pittsburgh, Pa. Proposed by J. C. Gobrecht.

Bottorft, L. W., Assistant Manager, Wayne Tool Manufacturing Co., 631 Fulton Bldg., Pittsburgh, Pa. Proposed by Samuel Lynn.

Campbell, W. T., Pay Master, Montour Railroad, Coraopolis, Pa. Proposed by J. A. Williamson.

- Chester, Chas. J., General Boiler Inspector, P. R. R., 7501 Susquehanna Street, Pittsburgh, Pa. Proposed by H. G. Huber.
- Conlin, James, Inspector, B. & O. R. R., 221 Second Street, Braddock, Pa. Proposed by W. C. Burel.
- Coyle, Dickson K., R. H. Blackall, 1305 Farmers Bank Bldg., Pittsburgh, Pa. Proposed by Robert H. Blackall.
- Crouser, Claude S., M. P. Inspector, P. R. R., 204 Pennsylvania Station, Pittsburgh, Pa. Proposed by J. L. Cunningham.
- Cunningham, Howard L., Assistant Chief Estimator, P. S. C. Co., McKees Rocks, Pa. Proposed by F. H. Freshwater.
- Davison, Charles R., Loco. Stoker Co., Robinson Street, N. S., Pittsburgh, Pa. Proposed by J. A. Williamson.
- Dickinson, Geo., Traveling Fireman, P. & L. E. R. R., Dawson, Pa. Proposed by A. Washburn.
- Fowler, W. E., Jr., Davis Brake Beam Co., 1202 First National Bank Bldg., Pittsburgh, Pa. Proposed by J. D. Conway.
- Friend, A. W., Car Recorder, P. & L. E. R. R., 7047 Hermitage Street, Pittsburgh, Pa. Proposed by J. C. Gobrecht.
- Goda, Pete, Assistant General Foreman, P. R. R., Pitcairn Car Shops, Pitcairn, Pa. Proposed by F. S. Robbins.
- Hall, J. A., Jr., District Manager, A. M. Byers Co., 412 Union Bank Bldg., Pittsburgh, Pa. Proposed by W. C. Burel.
- Hanolt, Edmund, Clerk, P. & L. E. R. R., 1242 High Street, N. S., Pittsburgh, Pa. Proposed by J. C. Gobrecht.
- Hayes, George W., Air Brake Foreman, P. & L. E. R. R., 1225 Vance Avenue, Coraopolis, Pa. Proposed by Samuel Lynn.
- Kleber, P. C., Boiler Inspector, P. & L. E. R. R., 831 Frank Street, McKees Rocks, Pa. Proposed by John B. Smith.
- Kramer, J. Kenneth, Clerk, P. & L. E. R. R., 166 Ulysses Street, Mt. Washington, Pittsburgh, Pa. Proposed by J. C. Gobrecht.
- Langbein, Paul, Clerk, P. & L. E. R. R., 232 N. Main Street, Sharpsburg, Pa. Proposed by J. C. Gobrecht.

- Laughlin, William H., Shop Inspector, Pennsylvania R. R., 222 Emerson Street, Pittsburgh, Pa. Proposed by G. C. Walther.
- Ludgate, B. A., Assistant Engineer, P. & L. E. R. R., Pittsburgh, Pa. Proposed by K. Berg.
- Lutton, Chas. W., Clerk, Monon. Railway Co., Brownsville, Pa. Proposed by C. J. Tanner.
- Maliphant, C. W., Assistant Supervisor, Shop Tests, W. A. B. Co., 329 Station Street, Wilmerding, Pa. Proposed by P. L. Lobez.
- Maphis, William H., Y. M., P. & L. E. R. R., 315 Braddock Avenue, Braddock, Pa. Proposed by J. B. Keptner.
- Meyers, Roy C., Assistant Storekeeper, Monon. Railway Co., Brownsville, Pa. Proposed by C. J. Tanner.
- Miller, R. E., Engineer of Tests, W. A. B. Co., Wilmerding, Pa. Proposed by S. W. Dudley.
- Moffett, L. W., Associate Editor, Iron Trade Review, 2149 Oliver Bldg., Pittsburgh, Pa. Proposed by J. D. Conway.
- Moran, J. V., Storekeeper, Monon. Railway Co., 520 East Eighth Avenue, Munhall, Pa. Proposed by D. H. Kinter.
- Norris, J. L., R. F. of E., B. & O. R. R., 4818 Chatsworth Street, Pittsburgh, Pa. Proposed by W. C. Burel.
- O'Brien, Arthur D., Manager, Standard Tin Plate Co., 326 W. Pike Street, Canonsburg, Pa. Proposed by W. J. Reese.
- Peoples, Jas. S., Assistant T. M., Pennsylvania R. R. Co., 1023 Ash Street, Johnstown, Pa. Proposed by J. V. McGaughey.
- Potter, H. R., R. H. Blackall, 1305 Farmers Bank Bldg., Pittsburgh, Pa. Proposed by Robert H. Blackall.
- Pratt, I. D., General Foreman, P. R. R., 1155 Liberty Avenue, Pittsburgh, Pa. Proposed by F. S. Robbins.
- Renshaw, W. B., Special Tester, W. A. B. Co., 309 Welsh Avenue, Wilmerding, Pa. Proposed by P. L. Lobez.
- Showalter, A. W., Wire Chief, B. & O. R. R., 4812 Monongahela Street, Pittsburgh, Pa. Proposed by W. C. Burel.

Sliger, F. A., District Boiler Inspector, B. & O. R. R., 301 East Green Street, Connellsville, Pa. Proposed by W. C. Burel.

Stauffer, J. G., Draftsman, P. R. R., 204 Pennsylvania Station, Pittsburgh, Pa. Proposed by H. G. Huber.

Strohmer, John L., Mech. Rep., Franklin Railway Supply Co., 1760 Homestead Street, Baltimore, Md. Proposed by H. B. Sewell.

Stumpf, F. L., Gen. A. B. Steam Heat Inspector, P. R. R., 407 Maple Avenue, Aspinwall, Pa. Proposed by H. G. Huber.

Swartz, O. W., Test Department, W. A. B. Co., Wilmerding, Pa. Proposed by S. W. Dudley.

Taylor, W. H., Rep., National Lead & Oil Co. of Pennsylvania, Commonwealth Bldg., Pittsburgh, Pa. Proposed by J. D. Conway.

Thorne, H. S., Test Department, W. A. B. Co., Wilmerding, Pa. Proposed by S. W. Dudley.

Turner, Stanley K., Sales Rep., A. M. Byers Co., 412 Union Bank Bldg., Pittsburgh, Pa. Proposed by W. C. Burel.

Weber, Andrew J., Clerk, P. & L. E. R. R., 5434 Wilkins Avenue, Pittsburgh, Pa. Proposed by J. C. Gobrecht.

Winn, Chas. F., District Manager, The Bird Archer Co., First National Bank Bldg., Pittsburgh, Pa. Proposed by J. A. Williamson.

Wolowski, Leo., Shop Inspector, P. R. R., 204 Pennsylvania Station, Pittsburgh, Pa. Proposed by H. G. Huber.

Yeager, J., Telegraph Operator, B. & O. R. R., 1225 Creedmoor Avenue, Pittsburgh, Pa. Proposed by W. C. Burel.

PRESIDENT: As soon as these applications have been approved by the Executive Committee the gentlemen will become members upon payment of the year's dues.

PRESIDENT: We will now hear the report of the Tellers of the Election of Officers, which will be read by the Secretary.

SECRETARY: The result of the election, as reported by the Tellers, is as follows:

PRESIDENT—Frank J. Lanahan.

FIRST VICE PRESIDENT—Samuel Lynn.

SECOND VICE PRESIDENT—D. F. Crawford.

TREASURER—F. H. Stark.

SECRETARY—J. D. Conway.

EXECUTIVE COMMITTEE—L. H. Turner, Chairman; D. J. Redding, F. R. McFeatters, A. G. Mitchell, F. M. McNulty, J. G. Code, D. M. Howe, J. A. Spielmann, H. H. Maxfield.

FINANCE COMMITTEE—E. C. Sattley, Chairman; Chas. A. Lindstrom, E. J. Searles, G. W. Wildin, J. F. Townsend.

MEMBERSHIP COMMITTEE—A Stucki, Chairman; C. O. Dambach, H. E. Chilcoat, J. A. Ralston, M. R. Reed, J. L. Cunningham, W. C. Burel.

ENTERTAINMENT COMMITTEE—D. H. Amsbary, Chairman; E. Emery, Henry F. Gilg.

RECEPTION COMMITTEE—F. H. Freshwater, Chairman; J. L. Smith, Harry B. Kelly, H. F. Grewe, H. M. Wolf, S. E. VanVranken.

SUBJECT COMMITTEE—John F. Lent, Chairman; Chas. Orchard, John B. Wright, Wm. J. Knox, E. B. DeVilbiss.

MR. D. J. REDDING: I move the election be made unanimous.

The motion was duly seconded and carried.

PRESIDENT: It looks as though quite a number of these gentlemen voted for themselves. The Chairman of the Entertainment Committee told me to cut all speech making, but we certainly cannot proceed further without hearing from our President-elect, Mr. Frank J. Lanahan.

MR. LANAHAN: Mr. President and gentlemen of the Railway Club of Pittsburgh: Some politicians. 294 votes all around. The fellows out in the "strip" could take a lesson from these fellows. They said it was unanimous. Evidently, they were not looking for any anti-slave votes, but you know when the "old reliable, stand-patters" do the counting, it is immaterial who does the voting.

No doubt on an occasion like this, one is expected to make mention as to the gratitude felt and exuberance experienced

over the honor that has been conferred. These grotesque caps that adorn your heads, by virtue of the edict from the Chairman of the Entertainment Committee, cause your faces to look so odd, that I hardly know how to address you. However, I realize it would take the eloquence of a Dave Redding, the dry humor of a Turner, the intellect of a Code, the polish of a Stark, combined with the wit of a McFeatters, the efficiency of a Conway and the soldierly bearing and magnetic influence of a Maxfield, as well as the unique conditions of a Stucki, to reach the flights of oratory that could adequately describe the situation.

Gentlemen, in all seriousness, I really do thank you for having given me this high honor. With such exemplary gentlemen as my predecessors, I cannot help but feel that to me is assigned a great privilege to follow in their illustrious footsteps.

Most remarkable is this Club as an institution, embracing in its membership, executives and leaders, people of wealth and influence, as well as those of humble position, moderate means and conservative living. In this organization, we all meet on the same level of equality, with no distinction or difference in any way manifested. It is true democracy of this type that should be encouraged and fostered, because it really represents those principles for which our great country was created. Quite beneficially but economically has our Club progressed intellectually, socially, and I guess, to a certain extent, gastronomically, because through the courtesy of the Entertainment Committee we have a delightful lunch served at every meeting, and in these days of the high cost of living, I do not know where you can get so much for your money.

But, gentlemen, as you have through the smooth functioning of your election board, presented to the members, the officers for the next year, I solicit, upon my own behalf as well as all the others who received the 294 votes, your hearty co-operation in every way. We who have been elected will endeavor to measure up to the past; we will try to follow the example that has been set for us, but it will only be by your help and earnest attention that we can succeed.

May I close by saying that if at the end of my term of office I can relinquish the Presidency with the same feeling of gratification as that of the soldier incumbent who is leaving

tonight, I certainly will feel deeply grateful. All I ask is that you, one and all, put up with my short-comings or failings and I will try to do my best.

Announcement was made of the deaths of H. A. Sheehan which occurred sometime in 1919, Mr. Frank Gibson which occurred June 21st, 1919, and Mr. J. C. Harbourt which occurred October 9th, 1920. The President directed that memorial minutes be inserted in the Proceedings.

PRESIDENT: We will now hear the Annual Report of the Secretary.

SECRETARY'S REPORT.

Pittsburgh, Pa., Oct. 28, 1920.

To the Officers and Members of

The Railway Club of Pittsburgh.

GENTLEMEN:

The following is a summary of membership and financial statement for the Fiscal Year ended October 28th, 1920.

MEMBERSHIP

Reported last year.....	1129	
Received into membership during the year.....	230	
	—	1359
Suspended, non-payment of dues.....	138	
Resigned	37	
Loss of address	17	
Died	17	
	—	209
		—
Present Membership.....		1150
Of the above membership seven are honorary.		

NAMES OF DECEASED MEMBERS

Two members died in 1919 but no report was received of their death until the present year. They are Frank Gibson, died June 21st, 1919, and H. A. Sheehan, date of death not known. The following died during 1920: A. B. Bellows, Dr. John A. Brashear, James J. Flannery, Joseph M. Flannery, Wm. H. Falkenstein, George E. Gies, J. C. Harbourt, J. D. McIlwain, D. C. Noble, R. L. O'Donnel, John Proven, J. S. Ralston, T. Titus, L. H. Turner, Jr.

FINANCIAL

RECEIPTS

In hands of Treasurer at close of last year..	\$5,817 53
From dues	2,999 00
From advertisements	2,082 70
From sale of tickets, Smoker Oct. 23, 1919	214 50
From collections on dinners, D. H. Amsbary	60 00
From refund on tickets, trip to W. E. & Mfg. Co. Works	7 92
From sale of Proceedings.....	1 50
From interest, Liberty Bonds, etc.....	167 45
Total receipts.....	<u>\$11,350 60</u>

DISBURSEMENTS

Printing Proceedings, notices, mailing, etc..	\$2,170 88
Hall, luncheon, cigars, etc., for meetings.....	989 13
Reporting proceedings of meetings.....	180 00
Salary of Secretary & advertising expenses	808 27
Messenger service	18 00
Luncheon, entertainment, etc., Smoker Oct. 23, 1919	616 90
Moving pictures	60 00
Stationery, postage and supplies.....	190 40
Carfare, special entertainment, etc.....	338 88
Floral pieces	65 00
Making half tones	18 63
Premium on bond, Treasurer & Secretary....	17 50
Payment of demand note, Coraopolis Sav. & Trust Co., for \$600.00, incl. interest..	611 25
Total disbursements	<u>\$ 6,084 84</u>
Net balance	\$ 5,265 76

NOTE—Cash is made up of \$2,265.76 and \$3,000.00 in Liberty Bonds.

J. D. CONWAY, *Secretary.*

Approved:

L. H. TURNER, *Chairman.*

D. J. REDDING,	J. G. CODE,
F. R. McFEATTERS,	D. M. HOWE,
A. G. MITCHELL,	J. A. SPIELMANN,
F. M. McNULTY,	<i>Executive Committee.</i>

Upon motion the report was accepted and directed to be inserted in the minutes of the meeting.

PRESIDENT: We will next hear the Annual Report of the Treasurer.

TREASURER'S REPORT

Pittsburgh, Pa., October 28, 1920.

*To the Officers and Members of
The Railway Club of Pittsburgh.*

GENTLEMEN:

I hereby submit Treasurer's Report for year ended October 28th, 1920:

ON HAND AND RECEIPTS

On hand October 23rd, 1919, including three

\$1,000.00 Liberty Bonds.....	\$5,817 53
Received from Secretary during year.....	5,365 62
Interest on bonds and bank balance.....	167 45
Total.....	—————\$11,350 60

DISBURSEMENTS

Paid on Secretary's Vouchers, 333 to 363 inc.....	\$5,014 57
Outstanding Vouchers, 364, 365, 366.....	1,070 27
	—————\$ 6,084 84
Balance on hand, October 28th, 1920....	\$ 5,265 76

RESOURCES

Three Liberty Bonds, \$1,000.00 each.....	\$3,000 00
Cash in bank.....	2,265 76
Total.....	—————\$ 5,265 76

F. H. STARK, *Treasurer.*

Approved:

L. H. TURNER, *Chairman.*

D. J. REDDING,	J. G. CODE,
F. R. McFEATTERS,	D. M. HOWE,
A. G. MITCHELL,	J. A. SPIELMANN,
F. M. McNULTY,	<i>Executive Committee.</i>

Upon motion the report was accepted and directed to be inserted in the minutes of the meeting.

PRESIDENT: If there is no further business to come before the Club, the meeting will be turned over to the Entertainment Committee.

MR. D. J. REDDING: Just before the Entertainment Committee begin their exercises I wish to call your attention to the fact that in conformity to a good old custom we have felt called upon, and responded willingly, to offer to the retiring President a little testimonial of the affection and respect we have for him. We were somewhat at a loss to know just what form this testimonial should take until it was suggested that as the retiring President had been in the army quite a while, he had perhaps accumulated some of the habits, good, bad and otherwise, which go with army life, and among them might be that of not getting home early in the evening. Not insinuating, of course, that you do not get home, but there seemed just the possibility that you might not. So in order that your family might have some check on your goings out and comings in, we decided that the thing that best fitted the emergency was a clock.

You remember the story of the cuckoo clock, the fellow who had a cuckoo clock and came home rather late and his wife called out to him to know what time it was. He said it was just eleven o'clock. Just then the cuckoo started to strike and when it got as far as three he was compelled to stand and cuckoo the other eight times himself.

We did not get a cuckoo clock, we got one that had a set of chimes and I do not know how you are ever going to imitate that. I might recommend that you buy a Jews harp and practice on it until you can reproduce the sound. Listen a moment and hear what you have got to learn. (Started the chimes).

PRESIDENT MAXFIELD: Fellow members of the Railway Club of Pittsburgh: It is pretty difficult for me to say just what I would like to say.

It has been one of the great pleasures of my life to have presided over the meetings of this Club. And I especially esteem it an honor to me, owing to the fact that I lost all and any right I might have had to this distinction when I entered the service and left the country and left you all in the lurch for a couple of years. Therefore, I particularly appreciate the honor of being elected your President upon my return.

I have felt that I have not been able to do a quarter of what I wanted to do for this Club. I suppose every presiding

officer has that same feeling when he gets through. But what I was not able to do was not because I did not want to do it, but simply because circumstances prevented me from doing it, and possibly I did not have the right cue at all times. However, I know that my successor will accomplish splendid results in his administration, just as he makes a splendid success of everything he tackles, and I want to most warmly congratulate the Club upon your selection of my successor.

I do not know exactly how to tell you how much I appreciate your kindly thought in presenting me with this beautiful clock. I think somebody must have been talking with my wife, because I have always wanted a big hall clock. It certainly is a great event in my life, or will be when I get it in my hall. Fortunately the hall in the house where I now live is big enough to hold the clock. I never lived in a house before with a hall that would hold a clock like that. So I do not have to rent a hall; later on I may have to, but I hope when I do that it will not take all I have as it does now.

Speaking seriously, I certainly appreciate this more than I can say. It is something which, of course, will be with me all my life and be with my family for many generations after me, I hope. And it will always carry with it the remembrance of the pleasant times I have had in my association with the Railway Club of Pittsburgh. I thank you, gentlemen.

Now the Chairman of the Entertainment Committee will kindly get on the job.

A highly entertaining programme followed, after which luncheon was served in the dining hall.

J. D. CONWAY, *Secretary*,

CONSTITUTION

ARTICLE I.

The name of this organization shall be "THE RAILWAY CLUB OF PITTSBURGH."

ARTICLE II.

OBJECTS

The objects of this Club shall be mutual intercourse for the acquirement of knowledge, by reports and discussion, for the improvement of railway operation, construction, maintenance and equipment, and to bring into closer relationship men employed in railway work and kindred interests.

ARTICLE III.

MEMBERSHIP

SECTION 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

SEC. 2. Persons may become honorary members of this Club by a unanimous vote of all members present at any of its regular meetings, and shall be entitled to all the privileges of membership and not be subject to the payment of dues or assessments.

ARTICLE IV.

OFFICERS

The officers of this Club shall consist of a President, First Vice-President, Second Vice-President, Secretary, Treasurer, Finance Committee consisting of five members, Membership Committee consisting of seven members, Entertainment Committee consisting of three members, and an Elective Executive Committee of three or more members who shall serve a term of one year from the date of their election, unless a vacancy occurs, in which case a successor shall be elected to fill the unexpired term.

ARTICLE V.

DUTIES OF OFFICERS

SECTION 1. The President shall preside at all regular or

special meetings of the Club and perform all duties pertaining to a presiding officer; also serve as a member of the Executive Committee.

SEC. 2. The First Vice-President, in the absence of the President, will perform all the duties of that officer; the Second Vice-President, in the absence of the President and First Vice-President, will perform the duties of the presiding officer. The First and Second Vice-President shall also serve as members of the Executive Committee.

SEC. 3. The Secretary will attend all meetings of the Club or Executive Committee, keep full minutes of their proceedings, preserve the records and documents of the Club, accept and turn over all moneys received to the Treasurer at least once a month, draw cheques for all bills presented when approved by a majority of the Executive Committee present at any meetings of the Club, or Executive Committee meeting. He shall have charge of the publication of the Club Proceedings and perform other routine work pertaining to the business affairs of the Club under the direction of the Executive Committee.

SEC. 4. The Treasurer shall receipt for all moneys received from the Secretary, and deposit the same in the name of the Club within thirty days in a bank approved by the Executive Committee. All disbursements of the funds of the Club shall be by cheque signed by the Secretary and Treasurer.

SEC. 5. The Executive Committee will exercise a general supervision over the affairs of the Club and authorize all expenditures of its funds. The elective members of this Committee shall also perform the duties of an auditing committee to audit the accounts of the Club at the close of a term or at any time necessary to do so.

SEC. 6. The Finance Committee will have general supervision over the finances of the Club, and perform such duties as may be assigned them by the President or First and Second Vice-Presidents.

SEC. 7. The Membership Committee will perform such duties as may be assigned them by the President or First and Second Vice-Presidents, and such other duties as may be proper for such a committee.

SEC. 8. The Entertainment Committee will perform such

duties as may be assigned them by the President or First and Second Vice-Presidents and such other duties as may be proper for such a committee.

ARTICLE VI.

ELECTION OF OFFICERS

SECTION 1. The officers shall be elected at the regular annual meeting as follows, except as otherwise provided for:

SEC. 2. Printed forms will be mailed to all the members of the Club, not less than twenty days previous to the annual meeting, by the elective members of the Executive Committee. These forms shall provide a method, so that each member may express his choice for the several offices to be filled.

SEC. 3. The elective members of the Executive Committee will present to the President the names of the members receiving the highest number of votes for each office, together with the number of votes received.

SEC. 4. The President will announce the result of the ballot and declare the election.

SEC. 5. Should two or more members receive the same number of votes, it shall be decided by a vote of the members present, by ballot.

ARTICLE VII.

AMENDMENTS

Amendments may be made to this Constitution by written request of ten members, presented at a regular meeting and decided by a two-thirds vote of the members present at the next regular meeting.

BY-LAWS

ARTICLE I.

MEETINGS

SECTION 1. The regular meetings of the Club shall be held at Pittsburgh, Pa., on the fourth Thursday of each month, except June, July and August, at 8 o'clock P. M.

SEC. 2. The annual meeting shall be held on the fourth Thursday of October each year.

SEC. 3. The President may, at such times as he deems expedient, or upon request of a quorum, call special meetings.

ARTICLE II.

QUORUM

At any regular or special meeting nine members shall constitute a quorum.

ARTICLE III.

DUES

SECTION 1. The annual dues of members shall be Two Dollars, payable in advance on or before the fourth Thursday of September each year.

SECTION 2. The annual subscription to the printed Proceedings of the Club shall be at the published price of One Dollar. Each member of the Club shall pay for both dues and subscription. Dues and subscription paid by members proposed at the meetings in September or October shall be credited for the following fiscal year.

SEC. 3. At the annual meeting members whose dues and subscription are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

SEC. 4. Members suspended for non-payment of dues shall not be reinstated until all arrearages have been paid.

ARTICLE IV.

ORDER OF BUSINESS

- 1—Roll call.
- 2—Reading of the minutes.
- 3—Announcements of new members.
- 4—Reports of Committees.
- 5—Communications, notices, etc.

- 6—Unfinished business.
- 7—New business.
- 8—Recess.
- 9—Discussion of subjects presented at previous meeting.
- 10—Appointment of committees.
- 11—Election of officers.
- 12—Announcements.
- 13—Financial reports or statements.
- 14—Adjournment.

ARTICLE V.

SUBJECTS—PUBLICATIONS

SECTION 1. The Executive Committee will provide the papers or matter for discussion at each regular meeting.

SEC. 2. The proceedings or such portion as the Executive Committee may approve shall be published (standard size, 6x9 inches), and mailed to the members of the Club or other similar clubs with which exchange is made.

ARTICLE VI.

The stenographic report of the meetings will be confined to resolutions, motions and discussions of papers unless otherwise directed by the presiding officer.

ARTICLE VII.

AMENDMENTS

These By-Laws may be amended by written request of ten members, presented at a regular meeting, and a two-thirds vote of the members present at the next meeting.

MEMBERS.

Adams, Lewis,
Clerk, P. S. C. Co.,
4004 Northminster Ave.,
N. S., Pittsburgh, Pa.

Aiken, Glen A.,
Vice-Pres., Sales Mgr.,
American Nut and Bolt
Fastener Co.,
Ontario & Doerr Sts.,
Pittsburgh, Pa.

Alexander, J. R.,
2615 Broad Ave.,
Altoona, Pa.

Allan, W. J.,
Sec. and Treas., Commissary
Co. of America,
1665 New Haven Ave.,
Pittsburgh, Pa.

Alleman, C. W.,
General Storekeeper,
P. & L. E. R. R. Co.,
McKees Rocks, Pa.

Allen, G. F.,
Agent, Pgh. & W. Va. R. R.,
4th & Liberty Aves.,
Pittsburgh, Pa.

Allen, Harry,
Train Master,
B. & O. R. R. Co.,
11 Mansion St.,
Hazelwood, Pa.

Allen, Howard L.,
Traveling Fireman,
P. & L. E. R. R.,
764 Mary St.,
McKees Rocks, Pa.

Allen, Jas. P.,
President,
Union Steel Castings Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Allerton, Harold S.,
Clerk, Union R. R.,
125 Blackhawk St.,
Pittsburgh, Pa.

Allison, John,
Chief Engineer,
Pittsburgh Steel Fdy. Co.,
Glassport, Pa.

Allison, John R.,
Shop Insp'r., Penna. System,
203 Pennsylvania Station,
Pittsburgh, Pa.

Amman, W. F.,
Ass't. Purchasing Agent,
Mon. Connecting R. R. Co.,
209 Moyer St.,
Mt. Oliver, Pa.

Amsbary, D. H.,
District Manager, Dearborn
Chemical Co.,
Farmer's Bank Bldg.,
Pittsburgh, Pa.

Anderson, A. E.,
President and Counsel,
Pgh. Dist. R. R. Co.,
1020 Bessemer Bldg.,
Pittsburgh, Pa.

Anderson, H. T.,
Chief Draftsman,
Freight Car Dept.,
Standard Steel Car Co.,
Butler, Pa.

Anderson, J. A.,
Asst. Supt. of Shops,
B. & O. R. R. Co.,
Glenwood, Pa.

Anderson, James W.,
Mgr. of Pneu. Tool Sales,
Ingersoll Rand Co.,
706 Cham of Com. Bldg.,
Pittsburgh, Pa.

Angell, C. P.,
Trainmaster, B. & O. R. R.,
205 North Mercer St.,
New Castle, Pa.

Anger, C. E.,
Upholster, P. & L. E. R. R.,
747 Boquet St.,
McKees Rocks, Pa.

- Antes, Edwin L.,
Foreman Elect. Dept.,
Pressed Steel Car Co.,
40 McKinney Ave.,
McKees Rocks, Pa.
- Anthony, J. T.,
Vice President,
American Arch Co.,
30 Church St.,
New York, N. Y.
- Arensberg, F. L.,
President,
Vesuvius Crucible Co.,
Box 47,
Swissvale, Pa.
- Arenth, Leo Henry,
Clerk, Penna. System,
308 Sixth St.,
Sharpsburg, Pa.
- Arnold, J. G.,
Car Service Clerk,
Montour R. R.,
8 Market St.,
Pittsburgh, Pa.
- Ashworth, Wm.,
Sales Mgr., Johnson-More-
house & Dickey Co.,
106 Market St.,
Pittsburgh, Pa.
- Aston, A. R.,
Ass't. to Chief Engineer,
Mon. Connecting R. R. Co.,
Kennedy Ave.,
Duquesne, Pa.
- Atterbury, W. W.,
V. P., P. R. R. Co.,
Broad St. Sta.,
Philadelphia, Pa.
- Austin, Walter C.,
Traffic Manager,
Carbon Steel Co.,
P. O. Box 1591,
Pittsburgh, Pa.
- Ayers, H. B.,
Gen. Mgr., H. K. Porter Co.,
49th St. and A. V. Ry.,
Pittsburgh, Pa.
- Ayres, W. C.,
Foreman Car Dept.,
P. C. C. & St. L. Ry.,
114 Railroad Ave.,
Carnegie, Pa.
- Babcock, F. H.,
Safety Agent,
P. & L. E. R. R.,
63 Terminal Annex,
Pittsburgh, Pa.
- Bacon, John L.,
District Sales Mgr.,
Franklin Rwy. Supply Co.,
751 Brighton Ave.,
Toledo, Ohio.
- Bail, Cail W.,
Asst Fore., Penna Lines West,
Ft. Wayne Shops,
N. S., Pittsburgh, Pa.
- Bailey, F. G.,
Chief Draftsman,
Motor Truck Dept.,
Standard Steel Car Co.,
Butler, Pa.
- Bailey, R. E. L.,
Sec'y., American Spiral
Spring and Mfg. Co.,
56th and Butler Sts.,
Pittsburgh, Pa.
- Bain, W. J.,
Shipper, Universal
Portland Cement Co.,
Universal, Pa.
- Baird, F. C.,
Vice-President,
Montour R. R.,
709 Oliver Bldg.,
Pittsburgh, Pa.
- Baker, George T.,
Genl Car Insp'r., P. R. R.,
Altoona, Pa.
- Baker, S. S.,
Supt., Clark Car Co.,
1639 Oliver Bldg.,
Pittsburgh, Pa.
- Bakewell, Donald C.,
President, Duquesne Steel
Foundry Company
Farmers Bank Bldg.,
Pittsburgh, Pa.

Ball, Geo. L.,
Treasurer,
Ball Chemical Co.,
230 S. Fairmont Ave.,
Pittsburgh, Pa.

Balton, N. L.,
Foreman, B. & O. R. R.,
19 Mansion St.,
Hazelwood, Pittsburgh, Pa.

Barnett, Geo.,
Special Representative,
W. W. Lawrence & Co.,
Pittsburgh, Pa.

Barney, Harry,
Secretary and Treasurer,
Laughlin & Barney,
Wabash Bldg.,
Pittsburgh, Pa.

Barnhart, B. F.,
R. F. of E.,
B. & L. E. R. R. Co.,
57 Chambers St.,
Greenville, Pa.

Barnhart, F. L.,
Secretary,
Union Collieries Co.,
410 Union Arcade,
Pittsburgh, Pa.

Barnhart, S. Elmer,
Clerk, P. & L. E. R. R.,
108 Fifteenth St.,
S. S., Pittsburgh, Pa.

Barratt, R. D.,
Car Inspector,
Monongahela R. R. Co.,
1513 Sheridan Ave.,
S. Brownsville, Pa.

Bartholomew, W. S.,
Pres't., Loco. Stoker Co.,
Robinson & Darrah Sts.,
Pittsburgh, Pa.

Basford, G. M.,
President, Locomotive Feed
Water Heater Co.,
30 Church St.,
New York, N. Y.

Batchelar, E. C.,
Manager, The Match &
Merryweather Mach'y Co.,
Farmers Bank Bldg.,
Pittsburgh, Pa.

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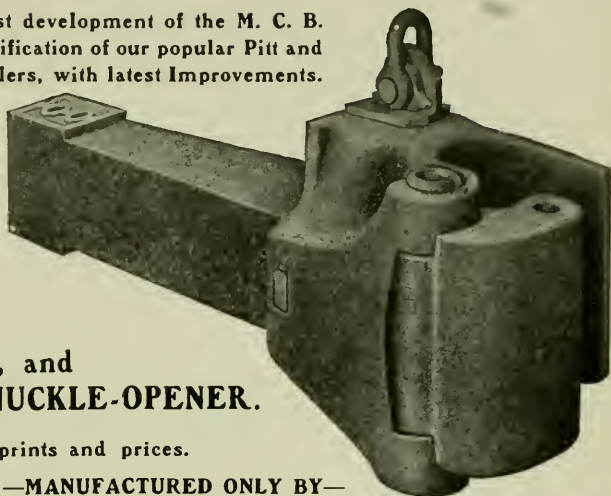
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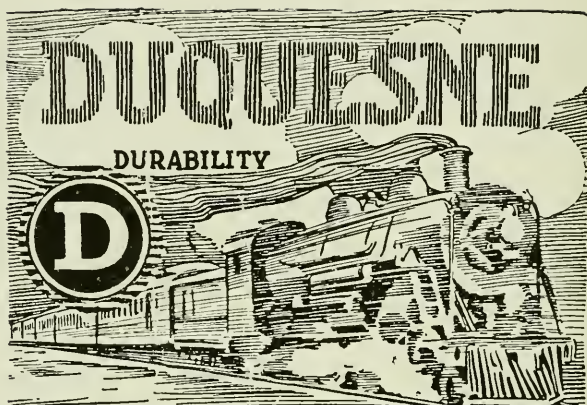
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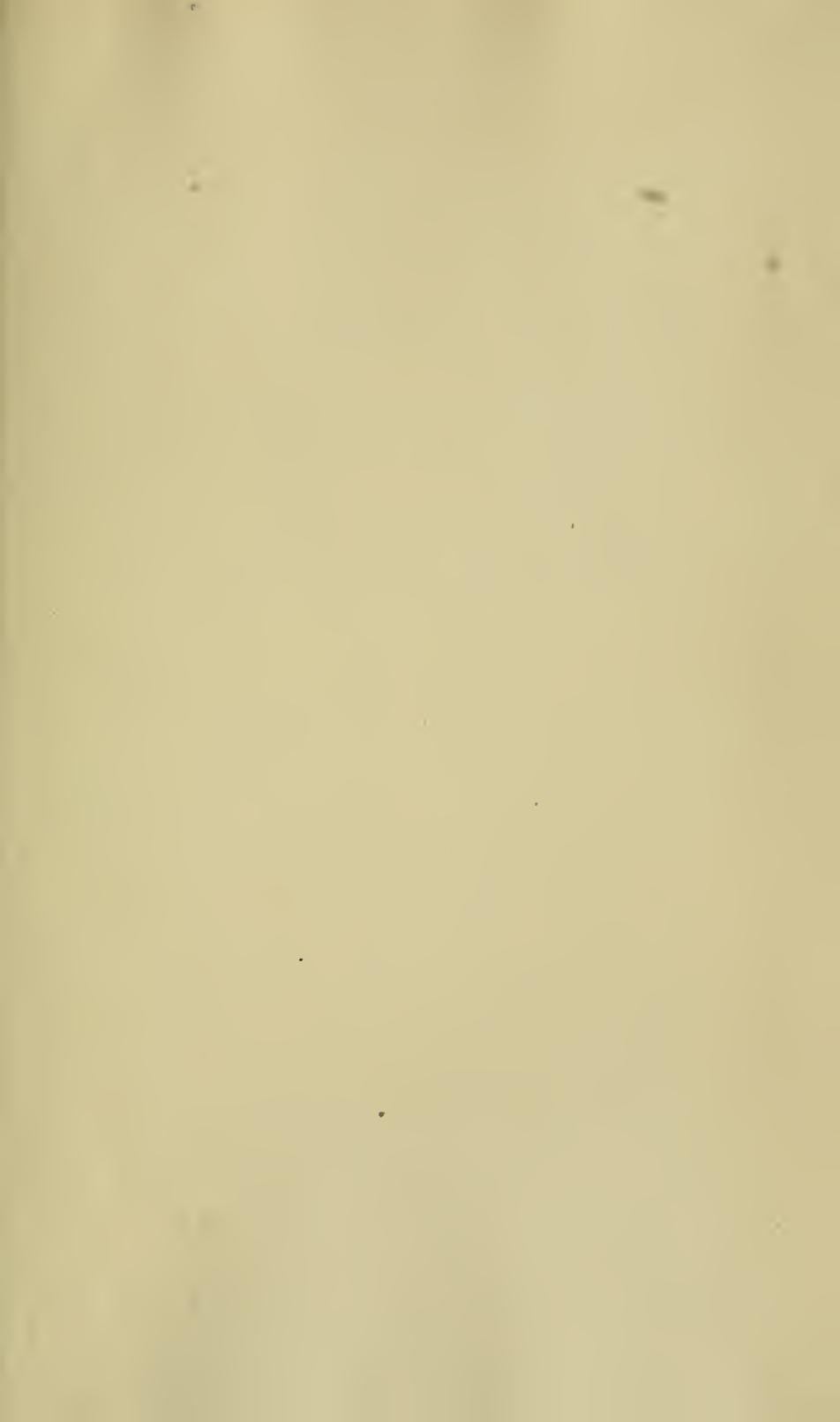
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